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October 1982  
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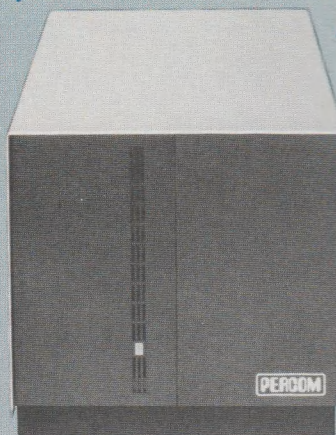
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# Inside Apple

Vol. 1 No. 1

## Apple adds a whole new cast of characters.

As you may already know, both the Apple® II and III can drive virtually every printer on the market.

Regretfully, not every printer on the market can offer you the same level of service and support you'd expect from Apple. So the same kindly, competent dealer who healed your Apple overnight may have no idea how to fix your Samurai Ichiban daisywheel.



Silentype. Dot Matrix. Letter Quality.

That's why we thought it would be nice, maybe even profitable, to offer a full line of printers that would look like Apples, last like Apples, with Apple warranties and Apple dealer service and Apple documentation.

We even gave them Apple names:

The new Apple Dot Matrix Printer.

The new Apple Letter Quality Printer.

And the new Apple Thermal Printer.

(Which is really the old, reliable Silentype™.)

Taking it from the top, our 7 x 9 Apple Dot Matrix Printer is a superb machine for correspondence-quality printing. With exceptionally legible, fully-formed characters, it gives you a choice of eight different type sizes and five different fonts. It can also give you proportional spacing. Plus boldface printing, underlining, varied pitches, varied line spacing and more.

With 144 x 160 dots per square inch, our Dot Matrix can put all kinds of high resolution graphics on paper—from bar charts and line graphs to digitized portraits.

The Apple Letter Quality Printer, on the other hand, is the preferred machine for just that. In fact, for any word processing or data processing applications where graphics aren't a primary concern.

For one thing, it lets you get the words out faster. At a blazing 40 cps

(instead of the usual 30-35), it's the speediest letter quality printer in its price range.

It also offers a full 130-character print wheel. (The current standard is a not-so-full 96 characters.)

Plus varied pitches and spacing, form or line feed, operation pause—seemingly unimportant talents until you discover your machine doesn't have them.

Both the Apple Letter Quality and Dot Matrix printers come with self-teaching diskettes. So your Apple computer can tell you how to use your Apple printer.

Naturally, all our printers—including the sturdy, inexpensive Silentype™—are deliberately designed to take full

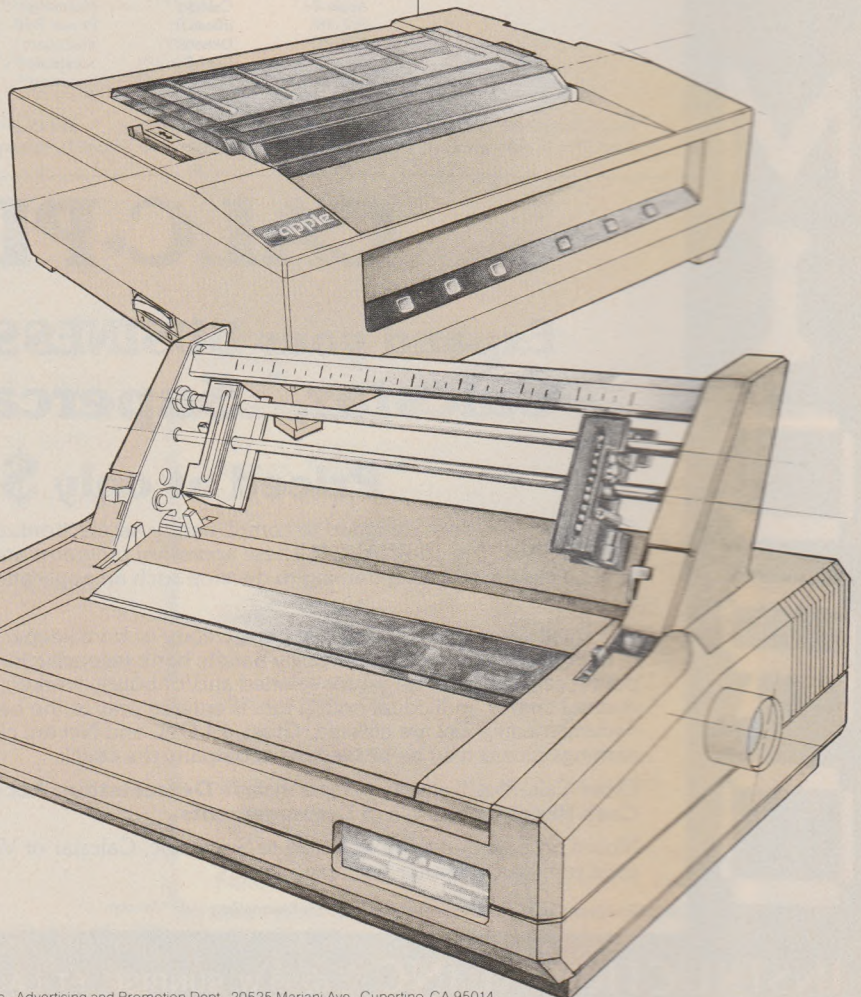
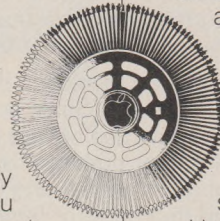
advantage of all the advantages built into every Apple computer.

The interfaces are clean, the electronics compatible. So you don't have to go peeking and poking to adapt print commands or parameters, or spend your summer vacation

klugging an interface. Which is a lot more than we can say for the Samurai Ichiban.

All of which should stimulate you, we hope, to see the newest Apples up close.

They look good, even on paper.



(800) 538-9696 (California: (800) 662-9238), Apple Computer Inc., Advertising and Promotion Dept., 20525 Mariani Ave., Cupertino, CA 95014



# MICROCOMPUTING

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On the cover: NEC's best-kept secret is now out in the open. The Spinwriter, long noted for its excellent print quality, also has special graphics features that generate equally outstanding business graphics. The cover photo (courtesy of NEC) shows a sample graphic generated by Timothy Stryker using the Commodore Business computer, the Spinwriter and a structured language he recently developed called RPL. For an explanation of how it's done, turn to page 32.



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## Time Is Ripe For Apple Magazine

Wayne  
Promises  
Best Ever

### **inCider**

With word spreading around the industry that three of the major magazines are on the block for sale, this would seem like a foolish time to think about starting a new magazine. People who go through the agony of starting a new magazine don't go out and sell it unless there are some powerful good reasons—that is, unless there is no other alternative.

So, with firms falling all around us, here we are getting ready to start a new publication. Obviously it must be one that is badly needed, right? Well, of course. That's why we're starting *inCider*, a new magazine for Apple users. Considering the success of *80 Micro*, can Apple compete in the long run with Tandy without a good, big, solid magazine? Sure, there are a number of smaller magazines supporting the Apple; some are very well done. We had the same situation in the TRS-80 field when *80 Micro* was started. Now the TRS-80 magazines are all doing better than before—there are even more in the field—and *80 Micro* has substantially helped the whole TRS-80 market to grow. Should we do less for the Apple?

Remember that IBM has unleashed a dozen or so Japanese firms into the micro market. Indeed, my latest count shows 145 different firms now making desktop computer systems with over 200 different models from which to choose. With that kind of competition, Apple needs all the help it can get.

If we are going to start *inCider* we are going to need a lot of help from Apple owners. Firstly, we are going to need more articles to publish than we have on hand. We're looking for articles written for the relative newcomer that will help to make the system easier to understand and easier to use. We need articles on simple-to-make accessories, hardware modifications and software conversions. We need ideas for applications of the Apple.

Both users and prospective users are interested in programs for the system, or conversions of programs written for other computers. If you can come up with Apple versions (or conversion information) of TRS-80 programs published in *80*

*Micro*, these will be of value to the readers of *inCider*. Conversions of any programs published in *this* magazine will be helpful.

The value of any computer system lies in the support it gets. This support takes the form of information published in magazines and books; it takes the form of accessories and peripherals; and it takes the form of programs. With solid support in these areas—support by hundreds of smaller firms—a system will have the best chance of succeeding.

In the battle between Apple and Tandy, remember that Apple has some tremendous advantages, as well as some serious drawbacks. The thousands of Radio Shack stores are a plus for Tandy, but this advantage is seriously undermined because these stores, for the most part,

---

With a major magazine  
supporting the Apple,  
the Apple support industry  
will grow faster.

---

do not have adequate technical help. Further, they are not permitted to sell supporting products by outside suppliers, nor are they permitted to sell about 95 percent of the documentation for their system.

Apple dealers are permitted (encouraged) to carry magazines and books backing up the system. These provide a wealth of documentary support which is denied Radio Shack customers. Remember that the more you know about how to use a computer, the more value it has to you.

While there is a wealth of superb software support for the Radio Shack system, that sold by Radio Shack is, at best, considered mediocre. Thus a large percentage of TRS-80 owners are forced to make do with second- and third-rate programs just because they don't know where to get the good ones, and they are not permitted to be sold—or even recom-

ended—by Radio Shack stores.

Apple stores, on the other hand, are encouraged to stock the better Apple programs, thus making up for a good deal of the overkill on stores by Radio Shack. It would appear that Apple has, in essence, merchandised circles around Tandy. Apple dealers tend to set up their stores so they look like places to buy computers. Radio Shack stores are set up like what they are: toy stores. And, worse, toys for the lower income people, for the most part. They are uncomfortable places to shop for a computer—another big plus for the Apple system.

With *inCider*, a major magazine supporting the Apple, I feel that the Apple support industry will grow faster, and that Apple will sell a lot more computers. There is a need for the added documentation and for the coverage of new products, both hard and soft. I think this will bring even more business to the several fairly specialized Apple support magazines—just as we have done in the TRS-80 field.

So, despite the state of the economy, and despite the troubles that several other magazines in the field seem to be in, we're going to move ahead with *inCider* and see if we can put out the best Apple magazine you've ever seen. I hope that you will think of it more as a means for intercommunications within the Apple world than as a pontifical technical magazine. We're going to do all we can to keep the material easy to understand so that relative newcomers to the Apple will understand it. This won't, of course, prevent us from covering some of the more obscure aspects of the system, and supporting products.

### **The White Collar Hobbyist**

The microcomputing field started out, some seven years ago, as a hobbyists preserve. It had to be, because the first micro came in kit form and in most cases didn't even work. Hobbyists put the kits together, figured out why they didn't work and passed the word along to the manufacturers, thereby finishing the last 10 percent of the design process.

The hobbyist—as both exhibitor and attendee—dominated the first micro-



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## More feats of wizardry with STOCKPAK

Standard & Poor's time-tested software also lets you evaluate and manage actual or hypothetical portfolios of up to 100 stocks each. And, you can create your own customized reports—displayed the way you want them.

Whether you use STOCKPAK to help improve your investment decisions, or just for the fun of it, it's good to know the source of this wizardry: Standard & Poor's, one of the world's leading financial publishers with a 120-year reputation of service to the investment community.

## Visit your local Radio Shack Computer Store today

STOCKPAK is designed exclusively for use on the TRS-80 Models III and I computers with 32K business systems and two disk drives. The basic software and sample database plus complete documentation is available from your Radio Shack computer store for only \$49.95. The STOCKPAK monthly updating service can be ordered directly from Standard & Poor's for only \$200 annually. Visit your local Radio Shack today for additional information and a demonstration.

**STANDARD & POOR'S CORPORATION**  
**25 BROADWAY, NEW YORK, N.Y. 10004**

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computer show in Atlantic City in 1976. Many of them came with their T-shirts and jeans and few were perfect abluaters.

Then, with the entry of the PET and the TRS-80 systems in 1977, kits fell out of vogue and there was an emotional swing against the hobbyist roots of the micro-computer business. This was aggravated by frustrations over hobbyist-run businesses, which were failing on all sides as a result of too little business knowledge.

With the availability of computers geared for the less sophisticated, it became fashionable to sneer at hobbyists and dismiss them as a market. Indeed, magazines catering to "hobbyists" found the term a kiss of death when it came to dealing with the advertising departments of the new manufacturers.

This preoccupation with deceptive labels is costing the micro industry heavily, for all is not as it first appears on the surface. Yes, the 1976 type of hobbyist peaked out in 1977, as we managed to run out of people with the technical background and the money to pioneer the industry. Before consigning them to the garbage heap of history, I do think that those of us in the industry today should at least be kind to our forbears, and perhaps, too, to the few survivors. We should remember that these hobbyists anted up the money which allowed our industry to grow and reach the still low level of maturity it has reached.

I have some news for you about hobbyists. We have managed to generate a whole new class of computer hobbyists. Indeed, we have far more of them today than ever before, and they are a huge, growing market. I call these people white collar hobbyists.

Think about it. It took me a while to adjust to what I was reading in the monthly surveys of the readers of *Microcomputing* but there was no denying what has

happened. A surprisingly high percentage of the people who buy a personal computer get personally involved with it. They want to learn more about it. They want to be able to do as many things as they can with it. They want to buy accessories for it. They want programs. Their investment in the computer is just beginning when they purchase the system.

The reaction against hobbyists, with the concomitant swing to the businessman as the customer, has kept many firms from stopping to think about this whole phenomenon. The buyer may be a businessman and he may have business in mind when he buys a computer, but the end result is the same: involvement on a personal level.

**We have managed to  
generate a whole new  
class of computer  
hobbyists. I call these  
people white collar  
hobbyists.**

Oh, I agree that today's hobbyist is not much interested in building circuit boards or kits. But the white collar hobbyist is an avid enthusiast. He is buying printers, interfaces, memory, disk units and modems, and he is learning how to write programs. He is getting all of the software he can and learning how to use it. He is also buying and reading the magazines which cater to his particular interest.

This explains the continued interest in *Microcomputing*. It explains the phenomenal success of *80 Micro*. If you've looked closely at *80 Micro*, you'll note

that it is aimed at the TRS-80 owner who has a strong personal interest in his system. The fact that the readers are spending about \$25M a month is testimony to the serious interest of this group. While sales of the TRS-80 computers may not have been growing as fast as other aspects of the industry, the support firms for the TRS-80 have been having a heyday.

I think this can help to explain the success of Apple, and the lack of similar success for many other computers which have turned their backs on hobbyists. I might even be bold enough to predict that the eventual success of microcomputer systems will depend on their support—from magazines, and by third-party firms in the form of accessories and programs.

There has been a sanctimoniousness, a rectitude, on the part of some firms which have turned their backs in scorn on hobbyists. There has also been a universal lack of outstanding success. Could there be a lesson in there somewhere?

Measuring the white collar hobbyist is difficult. I can see that *Microcomputing* magazine has certainly attracted this group, as has *80 Micro*. On the other hand, *Desktop Computing* has not. Of course, it is aimed at the businessman who has not yet really been bitten by the bug, so it may be that we are reaching people before they have their first computer experience. But, as we have seen, once the introduction is made, computers sure are habit forming.

It's this enthusiasm for the computer which has not only fueled the success of my magazines, but has fanned the spread of user groups. I had expected that with the promised demise of the computer hobbyist, prematurely buried five years ago by certain elements of our industry, we would see computer clubs fading away. We haven't. On the con-

Circle 285 on Reader Service card.

# PRICES YOU CAN'T BEAT!...

<p><b>SPECIALS THIS MONTH:</b></p> <table border="0" style="width: 100%;"> <tr> <td>PMC-81</td> <td style="text-align: right;">\$499</td> </tr> <tr> <td>LNW EXP. INT. Complete</td> <td style="text-align: right;">\$324</td> </tr> </table> <p><b>COMPUTERS</b></p> <table border="0" style="width: 100%;"> <tr> <td>Super Brain II</td> <td style="text-align: right;">\$1,935</td> </tr> <tr> <td>PMC-81</td> <td style="text-align: right;">\$565</td> </tr> <tr> <td>LNW-80 \$1,295</td> <td style="text-align: right;">LNW-80 II \$2195</td> </tr> <tr> <td>NEC 8001 \$729</td> <td style="text-align: right;">8012 I/O \$489</td> </tr> <tr> <td>TIMEX/SINCLAIR ZX-81</td> <td style="text-align: right;">CALL</td> </tr> </table> <p><b>PRINTERS</b></p> <table border="0" style="width: 100%;"> <tr> <td>EPSON (All W. 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## VESPA COMPUTER OUTLET

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trary, there are more user groups than ever, with no end to their growth in sight.

Will the top-selling desktop computers of 1985 be those bought by strictly practical businessmen to do specific tasks? Or will the winners in the marketplace be those that have the greater number of enthusiasts personally involved with them? I think the latter is the choice. Remember that even today, when business applications of our microcomputers are considered paramount, the mystique of the computer has won out. This is no ordinary business machine, this is a special breed of technological wonder, far and away beyond anything we've had before.

Indeed, it is this unexpected mutation of the hobbyist which has brought the software industry to its knees. User groups have, in many cases, become vast program-swapping organizations, costing the industry hundreds of millions of dollars... perhaps billions. While books and records enjoy a sales life of a year or two, computer programs last but a few weeks at best. By that time the proliferation of illegal copies virtually kills further sales.

Remember too that computers are now starting to enter the home in larger numbers. Oh, we've had the media hype about "home computers" for several years, but until the advent of the popular and low-cost game computers, we couldn't honestly claim that computers had much practicality in the home. I think we confused the personal interest phenomenon with the home and got carried away. Now, seven years after the start of the microcomputer revolution, we are seeing home computers.

Will the dedicated game computers fade away in the home, to be replaced by low-cost universal computers which can play the games, but which can also be used for simulations to help teach children? Will these newly emerging home computers be involved with home education? I think so.

Considering the way events have been developing, the strongest contenders in three and five years could well be those with strong magazines supporting them. This could be the key to survival, for without a magazine, there is little support for the growth of small firms bringing out support products for the host system, and, as I said, it is in this combined support that I expect we will find the leaders emerging, just as they have so far.

Owners of computers may be white collar hobbyists and be enthusiastic about their system, but they are practical about it and recognize the screw-ups of the manufacturer—often with exasperation—and turn to the magazines for help with their problems. They don't really go for the depth of the whitewash which in-house editors have to use to keep from having to look for other work.

I look to the white collar hobbyist to be the key to which firms come out on top in three and five years.

## Those "Toy" Computers

Radio Shack has started to distribute their color computer under the Tandy label as the TDP-100. One of the problems of the 100 is the lack of information about it and the paucity of programs so far available for it. Maybe you can help with that.

Many of the low-cost computer systems can be expanded and developed into useful computers. I'd like to see more material on these low-end computers, discussing their possibilities for growth as well as their limitations. If you've done some work with the Atari 400, the VIC-20, the Max, the TDP-100, etc., pass the word along so the rest of us will have more to work with.

We want to know how to improve the

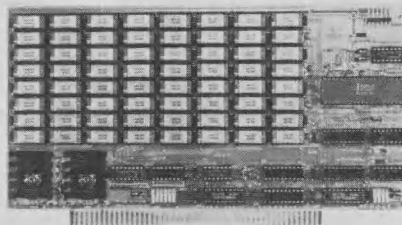
system, how to add accessories, how to test them, and so on. We need utilities for them to make program writing easier. We need to know how to convert programs from one system to run on another. This is going to be a very big market for the firms that get into it to support the best-selling systems, and without a communications medium, growth can be hindered.

I'd like to see some information on cassette use with these systems and what formats are being used. I know I've had a lot of trouble with the VIC cassette system, so presumably some readers have suffered this problem too and may, by now, have come up with a fix for it.

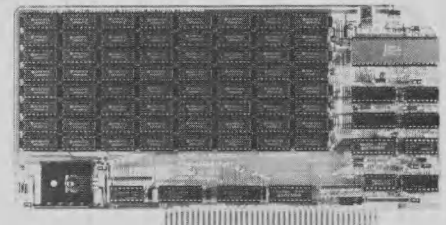
Let's see some articles. Just remember to be as complete as possible, double-space your typing, leave generous margins (or send it in on a TRS-80 disk, but include a printout), and use good photographs if at all possible.

Circle 375 on Reader Service card.

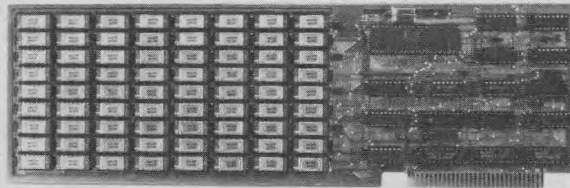
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## PC Compatibility Is a Big Plus

## Converting Programs Is a Snap!

Well, here it is October already (how can it be October, when I'm writing this in the first part of July and it's 95 degrees out there?), and I've got a backlog of things to do for the column. This month I'm going to give you a demonstration of how easy it is to convert programs from other Basics to the PC and, in the process, enhance them with color. I call this month's program PCSCRAZL. Next month you'll get a useful set of utilities for a PC equipped with an Epson (whoops, IBM) printer, which I call "IBM One-Pagers," since none exceeds a page of listing. I hope this will spur you to submit routines to the column for all of us to share. But first, let's get down to some business.

### Compilers and Interpreters

Even the casual user is now facing a bewildering array of compilers, interpreters and languages in which he/she may program on the PC. To name just some, there is UCSD Pascal, Fortran, PC-Forth, PC-Cobol, and Basic. How is the user to know which to buy and which to pass up? I hope we'll be able to dedicate a future column to just this question, and in a unique way.

Arlene Berlin (a Source friend, who runs a company called "Software 'n' Stuff" for the PC) suggested this idea to me, so I can't take much credit. See what you think, and if the response is favorable, "we'll do 'er." Arlene thought we might take one column and show some samples of code, say, on something simple and useful, in different languages. In this way, the column would have something for everybody, and users could compare the same little routine across languages to get a feel for what a language can do, and how it does it.

I liked the idea, and suggested to Arlene that she do a sorting program in Cobol. I have it, and will try to find room to print it next month (but, in reality, it will probably take two). When we print it, you Pascal, Basic, Forth, and dyed-in-the-wool-no-high-brow-languages-for-me as-

sembly programmers look at it too, and replicate it in *your* favorite language. When we get a complete set of comparable code segments, I'll try to write the text around it and we'll have a nice "compare and contrast" column which should make your purchase choices easier.

There's been some reaction to the column on The Source, most of it good and all of it welcome. Keep on Smailing (TCD292) and writing. If this column is going to work, you have to contribute, and we need to call the good stuff good and the bad stuff... well, not so good.

### New Releases—and News

New software is mounting up, and pretty soon you'll have an array of packages to choose from that offer real value for the money. Most encouraging to me are some serious business applications that have recently hit the dealers.

For example, I-Plot (Management Solutions, 17660 Millbrook Drive, Chagrin Falls, OH 44022) is a plotting program that will accept data from either the keyboard or a data file, and plot up to six data sets in either line, scatter, bar or pie chart format. The program is said to require a 128K PC with a color adapter and monitor. It lists at \$250, and I'll try to review it for you in the near future.

EasyPlanner, a programmable spreadsheet program for the PC, has been announced by Information Unlimited Software (2401 Marinship Way, Sausalito, CA 94965). The spreadsheet is said to merge well with the EasyWriter II package, so that you can underline, boldface and otherwise adjust the format of your reports. No list price is given in the press release, but I'll try to test this one too.

Sorcim (405 Aldo Ave., Santa Clara, CA 95050) has made its SuperCalc available for the PC, and has announced a new text processing system called SuperWriter. Rumor has it that the SuperCalc uses the color monitor to print negative values in red. Again, I've not yet tested them, but if you hold off a month I should be able to put both these programs to the

test for you and advise you on how well they actually work.

IBM has just announced that it has added 17 more retail stores as authorized IBM PC dealers, which brings the total to 90. Outlets such as the Micro Center in Columbus, OH, and a chain called the Computer Shoppe in Tennessee are among the new retailers.

Finally, you should know about Wes Merchant's IBM PC Bulletin Board System (BBS). The system, which is being upgraded/expanded every time I call, is set up because "IBM can't support the PC user in the manner they support the large CPU users so it's up to us to unite..." I don't know if they can or can't support us, but it sure is nice to have the BBS on stream. The telephone number (in Virginia) is 703-560-0979.

Questions of the Month Department: When is MicroPro going to update WordStar for DOS 1.1? Why haven't they done it already? Crosstalk has—with a nice letter recalling their program so they can fix it for the owner.

### Reviews of 25:01 and 25:02

Two software packages I received this month from Softrend, Inc. (P.O. Box 1462, Charlottesville, VA 22902, 804-293-5344) were their first entries in the 25th Hour series. The program 25:01—Time Scheduler and Organizer (\$99), and 25:02—Magazine/Book Reference, are similar, so I'll talk about them together whenever possible. The programs are written in unprotected but very dense Basic code, they require one disk drive, and are intended to simplify organizing either appointments or books and magazines. The documentation is well done, containing illustrations, sample screens and even a "what to do if something goes wrong" section.

The time management program, 25:01, is on the order of and intended to compete with IBM's Time Manager. But Softrend may have the more flexible program at the same price. This package tracks the calendars of several people



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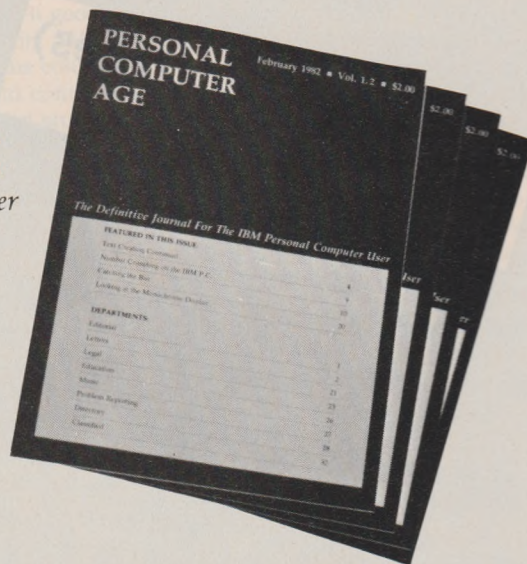
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(they use their own initials), allows entry of timed (say, a meeting with a client) as well as untimed (pick up the dry cleaning) activities, will repeat entries across different dates chosen by the user, and even accepts additional dates when the user is to be "tickled" to complete the task if it still hasn't been done.

Provision is made for printing out the schedule by day, week and month, and in other formats. The software lets you scan for an available time block (say, for a meeting) on your calendar—you can exclude or include weekends, specify desired starting or ending times, etc.

The 25:02 package, Magazine/Book Reference, is a simpler program than 25:01, but may be more valuable as a lesson in nice Basic coding than as an applications package. This program lets you input reference numbers, publication names, publication dates, an issue reference (for magazines/journals), a page number, the author, a primary and subtopic and two lines of comments or key words. The program stores this material on disk, and allows you to get at it in a number of ways.

I found a small bug in both programs. The setup screen wouldn't accept disk B as the data disk, and only wanted disk A. I called Softrend without identifying myself (until the end), and reached a sympathetic president who went to look at the code and said he'd call back with the fix. A nice way to treat the customer, even if the software shouldn't have bugs.

Should you buy it? I don't know. I've never liked electronic calendars, because I'm always where the calendar *isn't*, and the computer just won't go in my pocket. For those who can use them, this is a good implementation, but I'd be more inclined to buy it at \$75 than at \$99.

As for the Magazine/Book Referencer, it too works as advertised, makes good use of the PC function keys, and is a nice Basic program. Remember that the only thing you can do with it, though, is to catalog books/magazines. If that's your only application, fine. If not, maybe you should put your money toward a more general database management system. But, you didn't need me to tell you *that*, did you?

### Adapting Existing Programs for the PC: Scrazzle

When it's equipped with the Color Graphics Adapter, Advanced Basic and a suitable color monitor, the array of programming options available to the user is hard to describe.

For example, circles and ellipses require only a single statement, as do rectangles, squares and other less regular geometric figures that can be expressed in the IBM Personal Computer's special drawing sublanguage. Screen painting and box-filling are also single-command options in IBM's Advanced Basic language interpretation.

All this flexibility, though, comes at a

```

10 'Scrazzle
20 ' adapted for the I.B.M. PC from
30 ' Microcomputing, May, 1982, Page 32
40 ' by Thomas V. Bonoma
50 ' See also "Scramble", Microcomputing,
60 ' and
70 ' "Popping and Pushing Permutations in Basic"
80 ' by Kenneth Wasserman, Microcomputing, December, 1981, pp. 50-51
90 '
100 '
105 KEY(1) ON
107 ON KEY(1) GOSUB 3000
110 COLOR 14,0,3:PRINT "SCRAZZLE"
:PRINT:PRINT:PRINT:COLOR 7,0,0

120 PRINT"This program will accept test words of three to seven characters in "
130 PRINT"length. Lower case is first converted to upper case."
140 PRINT:PRINT "The characters are then arranged by ASCII value. Then all possible"
150 PRINT" combinations are printed in order of ascending alphabetical value."
160 PRINT:PRINT "You may select the number of right columns which you wish processed."

165 PRINT:PRINT "YOU MAY PUSH THE >>F1<< KEY AT ANY TIME TO END..."
170 COLOR 8,0,0:PRINT:PRINT "DATE: ";DATE$;" ";;COLOR 13,
0,0:PRINT "TIME: ";TIME$;;COLOR 7,0,0

190 '
200 '
210 '
220 DEFSTR A
225 DEFINT X:X=1
230 DEFINT V,L,C
240 GOSUB 2000:COLOR 7,0,0:PRINT:PRINT:PRINT:PRINT:INPUT "Test word ";A
245 COUNT = 0
250 PRINT"Number of right hand letters "
260 INPUT "to be manipulated ";B
263 L=LEN(A)
265 IF B>L OR B<=2 THEN PRINT:PRINT "B is out of useful range...enter again":
GOTO 250

270 PRINT
290 T1$=TIME$
300 FOR V=1 TO L:V1=ASC(MID$(A,V,1))
310 IF V1>96 THEN MID$(A,V,1)=CHR$(V1-32)
320 NEXT V
330 IF B<>0 THEN 400 ELSE B=L
340 ' SEQUENCE CHARACTERS IN ASCENDING ORDER
350 A=A+"z": FOR V=1 TO L
360 A1=MID$(A,V,1):A2=MID$(A,V+1,1)
370 IF A1>A2 THEN MID$(A,V,1)=A2:MID$(A,V+1,1)=A1:GOTO 350
380 NEXT V:A=LEFT$(A,L)
390 ' START AT PROPER ORDER OF SIGNIFICANCE
400 ON B GOSUB 420,420,620,580,540,500,460
410 IF B>L THEN 440
420 IF L<3 THEN COLOR 16,4,0:PRINT "WORD TOO SHORT";:COLOR 7,0,0
430 IF L>7 THEN COLOR 27,5,0:PRINT "WORD TOO LONG" ;;COLOR 7,0,0
440 GOTO 240
450 ' SEVENTH COLUMN SIGNIFICANCE
460 A7=RIGHT$(A,7):FOR V7=1 TO 7
470 A=LEFT$(A,L-7)+MID$(A7,V7,1)+LEFT$(A7,V7-1)+RIGHT$(A7,7-V7)
480 GOSUB 500: NEXT V7: RETURN
490 ' SIXTH COLUMN SIGNIFICANCE
500 A6=RIGHT$(A,6):FOR V6=1 TO 6
510 A=LEFT$(A,L-6) + MID$(A6,V6,1) + LEFT$(A6,V6-1)+RIGHT$(A6,6-V6)
520 GOSUB 540:NEXT V6:RETURN
530 'FIFTH COLUMN SIGNIFICANCE
540 A5=RIGHT$(A,5):FOR V5=1 TO 5
550 A=LEFT$(A,L-5)+MID$(A5,V5,1)+LEFT$(A5,V5-1)+RIGHT$(A5,5-V5)
560 GOSUB 580:NEXT V5:RETURN
570 'FOURTH COLUMN SIGNIFICANCE
580 A4=RIGHT$(A,4):FOR V4=1 TO 4
590 A=LEFT$(A,L-4)+MID$(A4,V4,1)+LEFT$(A4,V4-1)+RIGHT$(A4,4-V4)
600 GOSUB 620:NEXT: RETURN
610 ' THIRD COLUMN SIGNIFICANCE
620 A3=RIGHT$(A,3):FOR V1=1 TO 3
630 A=LEFT$(A,L-3)+MID$(A3,V1,1)+LEFT$(A3,V1-1)+RIGHT$(A3,3-V1)
640 'SECOND COLUMN SIGNIFICANCE
650 GOSUB 670:NEXT V1:T2$=TIME$:RETURN
660 'PRINT IT
665 COUNT =1
670 IF POS(0)>79-L THEN PRINT:PRINT
675 PRINT A;" ";
678 X=X+1: IF X>15 THEN X=1
679 COLOR X,0,0
680 PRINT LEFT$(A,L-2)+RIGHT$(A,1)+MID$(A,L-1,1);
685 COUNT = COUNT +1
690 PRINT " ";:RETURN
2000 'ELAPSED TIME ROUTINE
2001 ET=0
2005 PRINT:PRINT:PRINT
2010 S1=VAL(RIGHT$(T1$,2)): M1=VAL(MID$(T1$,4,2)):TT1=(M1*60)+S1
2020 S2=VAL(RIGHT$(T2$,2)): M2=VAL(MID$(T2$,4,2)):TT2=(M2*60)+S2
2030 ET=TT2-TT1
2035 IF ET<0 OR ET=0 THEN ET=0
2040 COLOR 5,0,0:PRINT"Elapsed Time: ";ET;" Seconds":COLOR 7,0,0
2045 COLOR 12,0,0: PRINT "Count: ";COUNT*2;" Different Ways":COLOR 7,0,0
2050 RETURN
3000 ' BRING EVERYTHING TO A PEACEFUL, CONTROLLED ENDING
3010 COLOR 28,0,4: PRINT "ENDING...":COLOR 7,0,0
3020 FOR J=1 TO 1000:NEXT J' A DELAY LOOP
3030 CLS: SCREEN 0,0,0: WIDTH 80: END
3040 'A RETURN WOULD ORDINARILY GO HERE, BUT YOU DON'T NEED ONE...

```

Program listing. Conversion for IBM PC of E. Stanton Maxey's Scrazzle program.



price. The *IBM Basic Reference Manual* is a hefty 411 pages long. Single graphics commands are complicated and take many parameters. For instance, the circle command must have a center and radius parameter; it can accept additional parameters for aspect ratio (whether you want a squashed or a flattened ellipse), the starting and ending angles (in radians, of course) for partial figures, and a color specification.

As a consequence of this useful complexity, it seems to me that users and potential users of the PC will fall into four camps: owners who are, as I am, struggling to expand their knowledge of PC text/graphics processing in useful programming ways; owners who already know almost everything; nonowners of the PC who own another machine but are tempted by the PC's flexibility and put off by the thought of reworking their good programs on the PC; and first-time hobbyists or business people wondering whether to pick the PC or another machine.

This month's program is addressed to the first, third and fourth groups. I'm not going to show you all the whizzbangs in the PC's bag of tricks, but rather argue that the folks at IBM managed to implement a useful standardized Basic interpreter that makes program adaptation easy, in addition to giving us all of those special features. In this adaptation (see program listing) of a program previously presented in *Microcomputing*, I use only the most rudimentary of the PC's text-manipulation abilities. You can see just how straightforward a plain-jane transformation of a published Basic program is for the PC, and evaluate its compatibility with all the software you already have, or wish to get.

The program I've adapted is called Scrazzle, by E. Stanton Maxey, and was published in the May 1982 issue of *Microcomputing* (see pp. 32-34). It prints out all the possible combinations of letters which compose a given input word. Scrazzle does this for words equal to or greater than three letters and less than nine letters long; for a bonus, it alphabetizes its output.

Thus, you enter a word, like "Tom," into the machine. You are asked how many of the letters, counting from the right, should be scrambled. Let's scramble all three. Scrazzle's output would be: OMT OTM MOT MTO TMO TOM. The program has little practical use (with the exception of one time when I was trying to unscramble a scrambled message, and couldn't do it by hand), but is a short and useful routine which teaches a great deal about string manipulation.

So, here is the list of modifications between IBM PC Basic and the MITS CP/M-based Basic used by Dr. Maxey. To keep things more readable, I'll list each change from Listing 2, which starts on p. 32 of the May *Microcomputing*. You

might want to check each off as you make it:

#### 1. No changes

Yup, that's it! The Microsoft Basic in the PC and the MITS Microsoft Basic Maxey was running are totally compatible, byte for byte, bit for bit, line for line, symbol for symbol. You can key in Maxey's Scrazzle as is, and run it the first time, perfectly. Try that on an Apple II, a Tandy machine or a PET!

Well, that's good to know if you've been keypounding on a Heath H-89 with Microsoft version 5.2 up until now and have finally gotten the color bug, but it sure doesn't make for a very interesting article. What kinds of modifications (non-graphics, but using the PC's special text-processing color commands) could the PC user ask for that Dr. Maxey didn't give us, assuming he/she just wanted to touch up the displays, pump up the information given by the program, and generally make Dr. Maxey even prouder of his creation? Further, what if no more than one hour was to be allocated for this task? After all, we do have to get back to learning about circle and draw commands.

---

**PC's Microsoft Basic  
and Mits Microsoft Basic  
are totally compatible,  
byte for byte,  
bit for bit,  
line for line,  
symbol for symbol.**

---

Listing 1 gives an adaptation of Scrazzle that meets all these constraints, and requires no more than a single hour to punch up the original Scrazzle. I call it PCSCRAZL on my machine. Here's what I did:

1. I liberally used the PC's text-mode color statement in the displays. The color statement allows three parameters in the PC text mode. The first, the foreground color, is the color you wish the text to be. A 7 represents white, an 8 gunmetal gray, and so on. The PC can display 16 colors (0-15).

But wait! What's that 16 for foreground in line 470? What's the 27 in line 480?

Well, I didn't tell you the whole truth on two counts. Those 16 colors can be flashing or non-flashing as well; add 16 to the color you choose (range = 16-31) and you get flashing letters. That's what those big numbers are about.

Oh, one more thing. If you don't have a monitor that accepts the PC's intensity output signal on the color video display, you won't get all 16 colors, but only eight of them. My Electrohome RGB (red-green-blue) monitor does accept these signals; your color TV set, or many other monitors, won't without modification. So, you'll be stuck with 16 possibilities (eight colors and eight flashing colors) for foreground.

The middle color parameter sets the color of the background against which the foreground character will be printed. You can see it used in statements 470 and 480, in which I wanted a flashing error message to be printed against red (4) and magenta (5) backgrounds, respectively. The background parameter in the PC's text mode is not retroactive. By that I mean that using this parameter in statement 470 doesn't change the whole screen to red, just the background around the message WORD TOO SHORT. That's nice, because it would be hard to read a whole screen painted the color of Dracula's dinner, especially if some of the existing text were also red.

The final color parameter is for the screen border. Let me explain. The PC doesn't print on the whole screen in text-mode, but rather saves about 1/2 inch on each side and 3/8 inch on the top and bottom as a border. That's where its softkey (function keys) descriptions are printed, for example. In text mode, you can program this area as well with a color that is independent of foreground or background. So, in line 130, I decided it would be nice if the title of the program, Scrazzle, was printed in yellow (foreground=14) on a black background (background=0) with a cyan (border=3) border. Now, that gets a user's attention even if the application is payroll posting.

2. I used the PC's key and on key commands to allow an idiot-proof and orderly ending to the program. Look at lines 110, 120 and subroutine 900 now. The ten function keys (F1-F10) on the PC's keyboard can be programmed as software interrupts (i.e., as keys which, whenever pressed, cause the program to jump somewhere and do whatever it finds there). In line 110, function key 1 is set up as an interrupt trap for the user. In line 120, the program is told where to jump if anyone pressed that key at any time (even during inputs, though you have to hit the enter key before the interrupt—otherwise, enter isn't needed).

The subroutine at line 900 brings everything to a peaceful end by clearing the screen (CLS), doing a screen command (the PC has eight text page screens and two graphics ones) to get everything back as it once was, setting the width of the display to 80 columns (a 40- or 80-column text display is software selectable with the width command), and ending.

3. I used the built-in DATES and



TIMES features of PC Advanced Basic to display the date and time when the program is run, and to give the time the program took to generate all those combinations of letters. This last function required programming a subroutine that should be of general use to you, regardless of your programming application. Look at line 340, in which T1\$ is assigned the value of TIMES (that is, T1\$ contains the time) when the program starts on our input word. Line 200, which comes up every time a job is done, calls the elapsed time subroutine at line 800 and following. Let's look at it a little.

First, the elapsed time (ET) is set to 0. Next, the start time (TT1) is computed by converting TIMES's seconds to an integer (S1), and adding to these the total number of minutes times 60 seconds (M1) in the minutes column. The same is done for the ending time (TT2), and a simple subtraction of end time TT2 from the beginning time TT1 gives the ET we need. This routine, just so it won't be too simpleminded, also counts (see line 780) the number of combination pairs produced by the program, and reports the total number of ways your word could be spelled.

4. I also added some error checking, which was not in the original program on input (e.g., line 320), so I had to move a couple of the original Scrazzle lines

around a little. Generally, however, no manipulation was done to the program logic so that you could see how easy an adaptation to PC from general Basic is.

Two more things are worthy of note. Dr. Maxey's code is not very elegant—the many "column of significance" subroutines he gives us, for example, could be done with one general-purpose algorithm, which would also remove the constraint of seven letters maximum.

Second, for a little program that really does little to nothing, my color display enhancements, elapsed time and other added quickie features make it very alluring. The thing to learn about this comes, not from PCSCRAZL, but from extending the principle to other adaptations.

Imagine a financial program in which loss amounts were printed in red, perhaps with a red-bordered screen. Or, think of an education program in which the output's color is systematically varied in association with its quality, correctness or other learning variable. (I did something similar by varying output colors with the color loop in lines 750 and 760. Each pair of scrambled words is a different color.)

Or think through your next time-management program, in which elapsed time, the date and other chronological variables are updated automatically, and the priorities on the things-to-do list are

color-coded by importance. The power of a colorful text display produced with no special constraints, by a single three-parameter command, is very high.

So if you do buy a PC to replace that Z-89, if you get a PC as your first machine, or if you already have one and can't quite figure out how to draw that Concorde, key in PCSCRAZL and learn how easy it is to convert and improve existing Microsoft Basic programs in only an hour. □

## MICRO QUIZ

### What Does This Program Do?

What number will be printed when the following program is executed?

```
X = 0
for J = 1 to 3
  for K = 1 to 2
    X = X + (2↑K + J)
  next K
next J
print X
```

(answer on page 149)

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# Modem Life In the Fast Lane

## Hayes, UDS Introduce High-Speed Units

This month in Dial-up Directory I'm going to introduce two special 1200-baud modems—one from Universal Data Systems and the other from Hayes Microcomputer Products. But first, let's look at two unique low-cost data communications packages.

### Phonedex I

In the July 1982 issue of *Microcomputing*, we published a list of more than 400 electronic message systems. This list was arranged according to the software the systems used. It could just as well have been sorted according to geography, area code, system hardware or subject matter. But re-sorting the list by hand would be a tedious job. Computers do tedious jobs well.

The folks at Starside Engineering have put together a telephone-list and terminal-communications package, called Phonedex, that takes only seconds to resort a list of names, numbers and other data. They call Phonedex "an electronic little black book." Phonedex has some interesting capabilities and some specific limitations.

#### Phonedex is:

Phonedex really falls into the category of database management systems. It withdraws and sorts data from master files based on specific user needs. It will hold up to 1200 entries on a single eight-inch disk. It will sort on any of 11 ASCII fields and sort up to four fields simultaneously.

I could, therefore, ask Phonedex to find all of the Remote North Star message systems in area code 813 that operate 24 hours a day and deal with a specific subject matter. In this example, Phonedex would return only one listing, but you don't have to be so specific with your sorting criteria.

Phonedex can be used like the more common mailing list programs to prepare and print mailing labels, sort ad-

dresses by zip code and do other sorts based on key data. It differs from other mailing list programs, however, in three ways. First, it makes special provisions for large auxiliary fields and wildcard requests. Second, it includes software that will autodial a Hayes Smartmodem and a dumb terminal communications program. Third, it only costs \$49.95.

Phonedex is written in machine language, so it operates very fast and needs no special languages to run. The queries into the database use a simple format, and entries into the database are guided by a friendly menu that gives help without being tedious.

The 75-page Phonedex documentation is excellent. The program refers to paragraphs in the manual whenever a new function is called. Even though there is no index, you'll find it simple to turn to the page containing the information on the function you want to perform.

By the way, I know that a lot of Dial-up Directory readers also enjoy reading science fiction. If you know your science fiction, you'll get an added kick out of some of the inside jokes used in the examples.

Installation of Phonedex could be a problem if you are running a CP/M system with a unique assortment of I/O boards. An installation program is included that will help to configure the software to your system, but you will have to know a few port addresses and system characteristics if you want to use the autodial and communications features of the software. A fully configured and ready-to-run version is available for the TRS-80 Model II.

#### Phonedex is not:

Phonedex is not, unfortunately, for everybody. In its present form it can only be run on CP/M systems with at least one eight-inch double-density disk or two eight-inch single-density disks. Starside promises that versions for the IBM PC and Apple III will soon be available, so get on their mailing list.

Phonedex is a good value at \$49.95. Contact Starside Engineering, PO Box 8306, Rochester, NY 14618. Phone 716-461-1027.

### PC-Talk

If you're looking for inexpensive and useful communications software for the IBM PC, you can't do much better than PC-Talk. This package was developed by Andrew Fluegelman at Headlands Press, PO Box 862, in Tiburon, CA. It's a competent and complete communications program for the IBM PC, but the unique thing about it is the way Andrew is marketing it.

Andrew calls his marketing scheme user-supported software. Andrew feels that copying and sharing programs should be encouraged, not restricted. Copying and transferring programs is impossible to prohibit and control, so you might as well make it work for you.

Under the Freeware plan, anyone may request a copy of a user-supported program by sending a blank, formatted disk to the author. The disk must be accompanied by a postage-paid return mailer.

A copy of the program and the documentation will be returned on the disk. The program will carry a notice suggesting a contribution to the program's author. The suggested contribution for PC-Talk is \$25. The user is encouraged to copy the program and share it with others. Each subsequent user reads the contribution suggestion every time the program signs on and follows his or her own conscience.

Andrew says that Freeware is an experiment in economics. He saves great sums of money in advertising and distribution

Address correspondence to Frank J. Derfler, Jr., PO Box 691, Herndon, VA 22070.





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The UDS 212LP modem provides only 1200 baud service, using the Bell 212 signaling scheme. It has no frills or additional operating features, is simple to connect and operate and costs less than \$500.

and receives a return from people with a sense of value and fair play. No word yet on how big that return is.

### What You Get

PC-Talk is a well-polished and professional program that could sell for several times the amount of the contribution being asked. It is now in version 2.0. It is written in Basic, but it performs well and contains a complete menu of desirable features.

PC-Talk includes a table of phone numbers and system characteristics that lets you select a message system or information utility from a menu. If the computer is attached to a Hayes Smartmodem, the program will dial the selected system and use a table of user-supplied parameters to configure itself with the proper speed, word length and other characteristics.

PC-Talk can transmit and receive disk files, transmit prestored strings of characters for system log-on or other commonly repeated commands, and change its formats and responses to meet the needs of various host systems.

The program includes an elapsed-time call display and a viewing routine that lets you view any file on the disks while the terminal program is still running. It makes good use of the special-purpose keys on the PC and the PC's ability to display a status line on the bottom of the screen.

### A Pair for 1200

The difference between 300 and 1200 baud is like the difference between skis and snowshoes: They both get you to the same place, but although skis may be more expensive, they are much quicker and smoother to use.

Twelve hundred baud service is offered at extra cost by the major information utilities and as an optional service on

some electronic message systems. Typical pages of information transmitted at this speed fill the screen in less than a second. If you know exactly what information you want, you can be in and out of an information utility very quickly and at little additional cost over a 300 baud session. If you frequently exchange data with another microcomputer or host computer, using 1200 baud service can save you time and long-distance charges.

Twelve hundred baud service is about the fastest speed that most people can economically use over dial-up telephone lines. Faster modems are made, but their cost is exponentially higher. The cost of a 1200 baud modem can be several times that of a 300 baud device, but added features and lower prices are making 1200 baud modems more reasonable investments.

Before we look at the two new modems, let's do a very quick review of modem signaling standards. The 300 baud signaling standard used by modems in the United States is called Bell 103. There are two 1200 baud signaling schemes described by the Bell standards.

The first is called Bell 202, and it is important to note that Bell 202 signaling is *not* used by the information utilities or by most message systems. It is used by some large computer systems in multiple terminal installations and by amateur radio operators in one-way radio transmissions. Bell 202 modems allow only one station to transmit at a time. These modems use fairly simple technology and cost only a little more than a 300 baud type 103 device.

The other signaling scheme is Bell 212A. This scheme is the one commonly used by information utilities and message systems. It allows simultaneous transmission and reception of data. The technology is much more complex and the cost for this kind of modem is much

higher. Modems that follow the entire Bell 212A pattern include a 103 standard 300 baud modem inside the same device.

### Hayes Goes High Speed

At the recent Comdex computer show in Atlantic City, Hayes Microcomputer Products released a Bell 212 standard 1200 baud version of their popular Smartmodem. This device is the same size as the Smartmodem and includes all of the same features.

For those of you who may not be familiar with the Hayes Smartmodem, it is called "smart" because it can monitor the data coming into it over the serial port and react to certain commands it recognizes. Its functions include dialing a number with either tones or dial pulses, putting the line off or on hook, answering a ringing phone, putting the sound of the phone line over a speaker, and controlling the echo. It can respond to the user with either decimal digit or English word result codes.

The 300 baud Smartmodem has been on the market for over a year and has gained wide popularity and support. Hayes provides a two-year warranty on their products and, as a matter of practice, they do repairs at very low or no cost even after that time.

The Smartmodem 1200 combines all of the features of the original 300 baud Smartmodem with a full Bell 212A standard modem. This modem includes special self-test and remote test features. It can also function as a 300 baud modem using the 103 signaling standard. The modem will automatically recognize and respond to either 1200 or 300 baud service when it answers the line, and it can be programmed for either mode if it originates the call.

Physically, the Smartmodem 1200 is identical to the original 300 baud Smart-



The Hayes Smartmodem 1200 provides Bell 212A 1200 baud communications while retaining all of the features of the original Smartmodem. It will operate at 300 or 1200 baud and has a suggested retail price of \$699.



modem except for one additional indicator light and the Smartmodem 1200 name plate.

Smartmodem 1200 sells for a suggested retail price of \$699. This is at the low end of the retail price range for standard 212A modems without the Smartmodem's special features.

Hayes Microcomputer Products is located at 5835 Peachtree Corners East, Norcross, GA 30092. Their phone number is 404-449-8791.

### The UDS Bargain

Now let's suppose that you already have a good 300 baud modem that you will use most of the time, though at certain times you would like to have 1200 baud service. You probably don't relish the idea of buying a \$700 combined 300/1200 baud modem using the full 212A standard and then trying to sell your old 300 baud modem. Let's suppose also that you don't need a lot of self-test and diagnostic features and that you probably don't need autodial or auto-answer on the 1200 baud device. If all of this supposing fits you, then you will be interested in a new "plain vanilla" 1200 baud modem recently introduced by Universal Data Systems.

The UDS 212LP uses the Bell 212 signaling scheme. Let me warn that UDS

also markets a 202LP 1200 baud modem using the Bell 202 signaling scheme—some ads I have seen are pushing this 202LP modem for under \$300. Don't confuse the two modems, because for information utilities and most message systems, the 202LP will not help you.

The UDS 212LP has a list price of \$499, but it is available at discounts through *Microcomputing* advertisers. UDS gets the modem down to this low price by cutting all of the frills. The 212LP has no lights or local test features. It does have a remote loop test feature that allows it to respond to more complex 212A devices. The 212LP does not provide for 300 baud service. It has a simple data/talk switch on the front panel and an originate/answer switch on the back.

The UDS 212LP shares a feature of other UDS modems in that it needs no outside power source. It connects directly to, and takes its operating power from, the phone line. Installation is simply a matter of putting the modem in series with the telephone using modular phone plugs.

Despite its simplicity, the 212LP gives good reliable performance. It does everything a type 212 modem really needs to do. UDS has been in the modem business for many years and its products are well known for performance and reliability. The 212LP is a good value because it trades off frills, not performance.

The UDS 212LP is the first 212 type modem to break the \$500 price barrier. Universal Data Systems deserves credit for aggressive marketing and imagination. Universal Data Systems is at 5000 Bradford Drive, Huntsville, AL 35805. Phone 205-837-8100.

### 212 or ?

The Bell 212A standard is widely accepted and is the de facto standard for information system operations, but I really wonder if it is the best standard. Some developers, like Don Stoner at the Microperipheral Corporation, feel that users seldom need to transmit at 1200 baud, but they often need to receive at that speed. He and others in the teletext industry have developed modems that use inexpensive signaling schemes to move information to the user at 1200 baud, but which provide a reply channel that more closely matches the typing speed of a user (up to 150 baud).

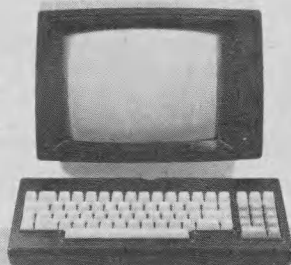
These modems are gaining acceptance in special applications such as video information and home banking, but we need some brave souls to accept them for use with an information utility in order to break the ice.

The price of speed in communications is going down. Improved and more creative services could be the result. □

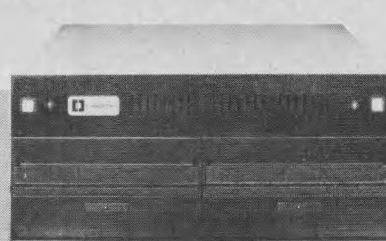
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# Commodore 64 Leads the Way

## First-Hand Report on New Units

### Commodore News

I was fortunate enough to get a first-hand look at the new Commodore machines at the Comdex show here in Atlantic City back in June. The new B and P series were functional prototypes but still quite impressive. There was quite a bit of interest in the new Commodore 64, while a single Max Machine sat idle most of the time I was there.

The top-of-the-line BX256 contains 256K of internal RAM with potential for an additional 640K of external RAM. It can also accommodate an optional Z-80 processor board in addition to its eight-bit 6509 and 16-bit 8088 processors. The planned retail price of the BX256 is only \$2995.

The B128 and P128 both contain 128K of internal RAM that can be expanded to 256K internally, and 640K can be added externally. They use a 6509 processor and can accommodate an optional Z-80 processor board but cannot use the 8088 processor used in the BX256. The planned retail price of the B128 is \$1695, while the P128 is only \$995.

The BX256 and B128 both have 80-column by 25-line green phosphor display screens that can be adjusted with tilt and swivel controls. The P128 connects directly to a television set or monitor via a built-in rf modulator. Its display is only 40 columns by 25 lines but it supports 16 colors for either text or graphics. A high-resolution graphics display mode allows 320 by 200 pixels.

The B series machines feature a detachable full-sized keyboard with a standard typewriter layout, as well as a separate numeric keypad, editing and individual cursor controls and ten programmable function keys. The numeric keypad includes a double zero, clear entry, question mark and double-sized enter keys in addition to the normal 0-9, plus, minus and slash keys. The P128 has the same keyboard but it's not detachable.

All B and P series systems include 40K

of ROM and built-in interfaces for IEEE-488, RS-232, CBM cassette, eight-bit user port, direct audio output and a cartridge slot. The P128 also contains a direct video output and ports for joysticks, light pens, paddles, etc.

Sound generation on all of the new machines (from the BX256 to the Max) is provided by a new 6581 Sound Interface Device (SID). This chip provides three independent voices with nine octaves each; programmable attack, decay, sustain and release (ADSR); a programmable filter; and variable resonance and master volume controls.

The Commodore 64 physically resembles the VIC-20 (see photo) and can use all VIC-20 peripherals. Its suggested retail price is \$595 but mail order discounts are already advertising it below \$500.

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**The Commodore 64  
is probably the most  
interesting of the newer  
machines for the average  
home user.**

---

With a PET emulator, the Commodore 64 will operate just like a 40-column PET in most areas. A Z-80 add-on processor board will allow you to run CP/M as well. Graphics capabilities include: 320 by 200 pixels, 16 text colors, 255 foreground/background color combinations, 256 movable "Sprites," independent magnification, and extended hi-res modes.

This machine is probably the most interesting of the newer machines for the average home user. The Comdex crowd seemed to spend most of its time looking this one over closely.

The Commodore Max Machine (formerly called the Ultimax) has the same color and sound capabilities as the Commodore 64 but without much internal memory. As such it cannot do anything without an external cartridge. With the optional Basic

language cartridge you can develop standard Basic programs that can be translated for use with all other Commodore systems. The Max Machine's Basic supports nine-digit numeric accuracy, built-in math functions and string capabilities.

This machine was not very impressive—most people would prefer paying a little more for the VIC-20. The Max lists for \$179.95 and VIC-20s can be found for under \$230.

At the summer Consumer Electronics Show (CES), Commodore announced its new Commodore Information Network, which can be accessed via CompuServe by selecting "CBM" when signing on. Once on Commodore's network, you can select from the menu to get Commodore News, Directories or Tips.

Selecting Commodore News gives you access to a public bulletin board where you can post comments and questions or get abstracts from Commodore's user publications, worldwide input concerning Commodore products, information from and about Commodore user groups or price lists and announcements of new Commodore products.

Commodore Directories provide an up-to-date list of authorized Commodore dealers and a directory of user groups throughout the United States by geographic area. Hopefully this list will be more current than the one they've been printing in the Commodore magazines.

In Commodore Tips you'll find answers to most common questions about Commodore products, categorized by topic for easy access. Commodore experts will also provide technical tips on hardware and software applications in this section to enhance both practical and playful applications of Commodore computers.

VIC-20 users will be able to access the

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*Address correspondence to Robert W. Baker, 15 Windsor Drive, Atco, NJ 08004.*



## A family of four spreadsheet programs

EasyCalc is the biggest micro worksheet available, with 65 columns and 999

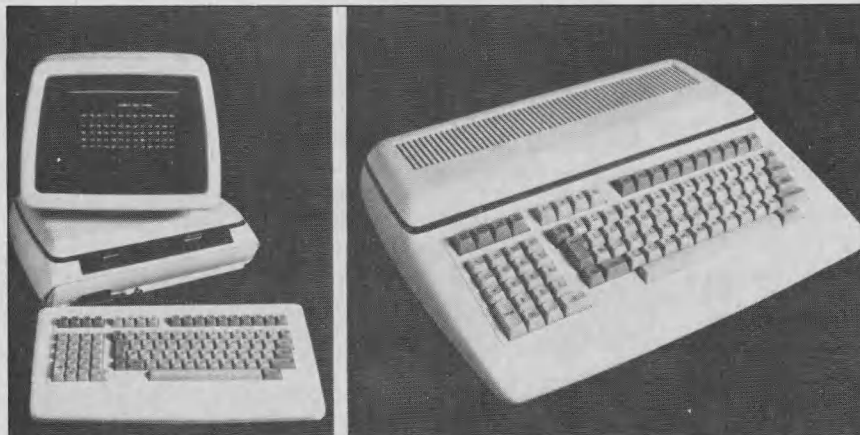
EasyCalc has "help" functions to aid first-time users and experts alike. It can print out all formulas and assumptions, and its disk-based grid allows automatic matrix consolidations. Additional features include movement of data in a matrix, selective row reporting and printing, instant "what if" calculations, and integration with Commodore's EasyPlot spreadsheet program.

EasyTools from Commodore allows users to analyze alternatives and see pros and cons so vital in decision making. It features automatic buy-versus-lease analysis, full loan amortization functions, present and future cash flow calculations and discounted cash flow analysis to help make decisions regarding borrowing, tax deductions and the cost of inflation.

The fourth member of the new spreadsheet family from Commodore, EasyScan, is an instant access diary that never lets you forget. It presents your day, week, month or year at a glance, organizes data by priorities, and lets you "zoom" in for an in-depth look. EasyScan allows users to schedule time and resources for optimum



The Commodore 64 attracted a crowd at Comdex this summer.






*The new business machines from Commodore.*

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productivity and also serves as an appointment secretary and project planner/task coordinator.

Each of the Easy spreadsheet programs will retail for \$124.95 for the SuperPET and \$79.95 for the Commodore-64.

Thirteen exciting new cartridge games for the VIC-20 were featured by Commodore at NCC in June. The Bally/Midway games Gorf, Omega Race and Wizard of Wor are real arcade games. High-resolution graphics, sound effects and play action are reportedly exactly like the popular coin-operated games.

Commodore's own Space Vulture, Raid on Fort Knox and Pinball Spectacular have the same kind of fast action and exciting graphics as the arcade games. Mole Attack and The Sky is Falling are Commodore's new cartridge games for young children.

Commodore also introduced five challenging Scott Adams adventure games: Adventureland, Pirate Cove, Mission Impossible, The Count and Voodoo Castle Adventures. These games, previously available only for high-priced systems, are cumulative fantasy games that can be saved and played over a long period of time.

Well, that's the end of the stack of press releases for this month. Sure was a busy time back in June and July! If your company is producing anything for the new machines let me know so we can spread the word.

## On Line Software

On Line Software offers two game programs with separate versions available for just about every Commodore system. Millipede is similar to the popular Centipede arcade game and is the better of the two games being offered. As expected, you try to exterminate the oncoming millipedes and fleas as they descend through the mushroom patch. Giant bounding spiders try to pounce on you while the dreaded scorpion leaves poison mushrooms behind. This game actually has 52 separate levels of play and you can start right in at the high speed mode (level 27) if you think you're good enough. The VIC-20 version of this game is really great—it was all I could do to get my son to stop playing.

Wallbanger is an original arcade-style game that combines high speed action and strategy. You're inside an enclosed area with one to four bouncing balls. While going through the dodge'm, blast'm and attack modes you try to destroy the bouncing balls before they destroy you. If you're successful the walls close in for the next round of play.

Both games are written in assembly language, giving good, fast play action. Sound effects are included and the VIC-20 version includes color graphics. The keyboard is normally used for movement and fire controls; joysticks can only

be used on the VIC-20 versions. However, with either method of control you can't move and fire simultaneously, which can be frustrating. Even so, both games are well done and reasonably priced at \$15 each on cassette tape.

For more information or free game details you can write: On Line Software, PO Box 2044, Orcutt, CA 93455.

## Misc

VIC-20 owners should be aware that another bug has been found in VIC-20's Basic. It only appears when you open a logical device and use the Print# to output to that device. If the first argument of the Print# statement is a Tab(. .) or SPC(. .) function, you'll get a syntax error when the Print# statement is executed. This little example quickly shows what happens:

```
10 OPEN 3,3
20 PRINT#3,SPC(5);"HI THERE"
```

When you run this short program you'll get a syntax error on line 20. If you replace the SPC with Tab and try it again you'll get the same results. Line 20 is perfectly correct according to the manuals and will execute correctly on any other Commodore system. The VIC just doesn't like the Tab and SPC as the first argument of the Print# statement. They do, however, work correctly anywhere else in the Print# statement.

Fortunately you can easily overcome this small problem by simply adding a null string to the beginning of the Print# statement. This line 20 will work correctly:

```
20 PRINT#3,"":SPC(5);"HI THERE"
```

In these simple examples I've used device #3 (the display screen). This is the simplest device to play with since not everyone has a disk or printer and it takes too long using the cassette tape. The problem shown here does not depend on any particular device—it happens on all of them.

My program package on disk that I mentioned in an earlier column is now available through Eastern House Software, 3239 Linda Drive, Winston-Salem, NC 27106. The price has been lowered to \$25, since they're now doing all the work of reproducing the disks. You need a printer to print your own documentation, but you can print additional copies as needed. Watch their advertisements for more details or you can write to the above address.

This package consists of two disks in 4040 or 8050 format. Over 40 program files are on one disk, with documentation on a second disk. The programs included are all from various articles and columns I've done over the past three years. □

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# LETTERS TO THE EDITOR

## Discouraging Software Piracy

I am writing in regards to your recent article "How Safe Is Your Software?" by Jake Commander and Mike Vose, which appears in July *Microcomputing* (p. 60).

One of the main problems with protecting software is that it is not in the interests of the semiconductor manufacturers to provide machine verifiable serial numbers on each microprocessor chip. Or is it?

A few years ago, I set up a system to keep track of production and yields for Harris Semiconductor, and it appears to me that there may be a way which will satisfy both the semiconductor manufacturer and the software house.

As chip capability grows, integrated circuit production yields decline. These lower yields frequently prompt management to become interested in statistical analysis. Die location, mask number and wafer fab batch numbers take on new significance when one is trying to optimize production and minimize material and labor on ICs that never make it out the door—or even worse, ICs that may come back as rejects.

What better way to find out where a good chip came from than to ask it during the final test prior to shipping? And what better way to ensure that chips from statistically marginal locations are checked extra thoroughly before they are packaged? In fact, all sorts of adaptive testing strategies become feasible once the production line can identify each chip.

Therefore, it may be in the interest of semiconductor manufacturers to consider providing a mask/batch/die-location-on-wafer processing number in the form of a read only register or ROM location. True, this number would not be unique; but given the number of chips a wafer is broken into, and the number of masks used over a product life span, (masks wear out a lot faster than you would suspect), the odds that any two computer systems had the same CPU process number would be relatively low. If the odds were low that a bootlegged program would run, it might tend to discourage piracy.

True, there is the matter of the software checking that number and taking appropriate action, but in my years of consulting I've seen and heard of more than a few ways to disguise such a check on the large machines, and we all know that microcomputer people tend to be more creative.

There may, of course, be other reasons which would make this impractical. There are easier ways of serializing chips, but would they be as easy for the manufacturers to check on a routine basis?

There is another matter, though—a program is of little use without information. With the proliferation of databases in the mid-eighties, what will prevent the data pirate from buying (as a user, not as a reseller) or stealing information from several sources, combining and reformulating it in some way, then reselling it as his own? We should start thinking of ways to imbed serial numbers in our data. I doubt if the old mapmaker's trick of adding or deleting a town name will work with sophisticated information pirates, and woe unto the legitimate user who uses such a piece of polluted data.

John V. Vilkaitis  
Thomaston, CT

## Sounding Off

In the May 1982 issue of *Microcomputing*, Alan E. Hufnagel ("The H-89 Sounds Off" p. 56) presented a simple modification to the Heath H-89 computer to allow users to program sound effects. Users should be cautioned about the program listings presented in that article. The general purpose port (362 octal) has several uses and the program listings do not reflect them properly.

Bit 1, for example, enables the 2 ms clock interrupt. Mr. Hufnagel's programs are correct in resetting this bit during execution, since interrupts will upset the program timing, but it should be set on exit from the program. Some software packages require this interrupt to be active. (An example is the PIE editor from Software Toolworks.)

More important for users of newer H/Z-89s (or older ones which have been modified to run standard ORG 0 CP/M) is that bit 5 of this port controls the memory map of the 89. If bit 5 is set, memory is ORG 0. If it is reset memory is ORG 4200H. Thus, if the system is running at ORG 0, bit 5 should be set on EVERY WRITE to the port. Otherwise, the memory map will be altered during execution with unpredictable results.

Unfortunately, the port cannot be read to determine its current status. The hardware maps an option switch into this port for read operations. Thus, the memory organization must be known when the software is written.

I have included a program listing which will execute the "siren" effect

```
SIREN . ASM
;
; Assemble with CP/M ASM
PORT EQU 362Q

; Don't set the following bits:
; 0 = single-step enable
; 1 = clock interrupt

; Must set the following bits:
; 5 = org 0 memory map

; Toggle bit 4 for speaker control
;
; Set bit 1 on exit to CP/M

ON EQU 0011000B ; Speaker on
OFF EQU 0010000B ; Speaker off
RESET EQU 00100010B ; Reset to standard system

ORG 100H

CALL SIREN ; Each call gives one
CALL SIREN ; siren cycle
CALL SIREN
MVI A,RESET ; Reset the port
OUT PORT ; and return
RET ; to CCP

SIREN: MVI A,ON ; Turn it on
OUT PORT
MOV A,B

LOOP1: DCR A ; Wait
NOP
NOP
NOP
JNZ LOOP1

MVI A,OFF ; Turn it off
OUT PORT
MOV A,B

LOOP2: DCR A ; Wait
NOP
NOP
NOP
JNZ LOOP2

DCR B ; See if done
JNZ SIREN
RET
END
```

## Program listing.

properly with an ORG 0 H-89. The program is in 8080 mnemonics and will assemble correctly using the standard CP/M assembler.

Mr. Hufnagel has contributed an excellent and very inexpensive modification to the H-89. With some care in programming, it can be quite an asset.

William R. Brandoni  
Willoughby, OH

## Reply:

Mr. Brandoni is correct that the program listings in my article were only samples and did not consider all the possible uses of the General Purpose Port. Those readers considering sound modification should heed Mr. Brandoni and carefully explore the ramifications



of manipulating this port while under their particular hardware/software configuration.

**Alan E. Hufnagel**  
Montgomery, AL

## A Need for Programming Information

I commend *Microcomputing* on its in-depth articles on software legal protection in the July 1982 issue. You covered a great deal of material in a factual and straightforward manner.

However, I feel that there must be a great need for instructional information on the subject of how to write operating systems, games and other software. Otherwise why the need for piracy?

The problem should go away when average hobbyists can gain access to better training material for programming than is now available.

**Arthur Guy**  
Madera, CA

## Redefining Computer Crime

"Computer crime" is becoming a common term, but we have recently been victims of a rather unusual form of it. A remarkably sophisticated and specialized burglar broke into our house. To the great surprise of the police, the only thing he took was the 128K Saturn RAM board which I had recently installed in my Apple II. Nothing else (except one unrelated diskette) was taken or disturbed. This is certainly a step beyond piracy of programs, although I suspect that people who try to achieve a reasonable income developing and selling programs might not agree.

I had been thinking of submitting a review of the RAM board to *Microcomputing*, and the thief seems to have given it a favorable review. During the brief time I had it, I too was quite impressed by the Saturn card, and I agree with the burglar that it was the single most valuable thing in my Apple. It did a fine job of speeding up the compilation of large Pascal programs, offered lots of programming space and convenience for Basic programs; the accompanying software performed flawlessly. Furthermore, the documentation was clear, complete and easy to follow. Apparently the thief didn't recognize the value of the manual and diskettes; he failed to take any of them. Unless he is a sophisticated programmer, the card will be useless to him without these items—I find that fact somewhat consoling.

This leads to the point of this letter. I would be grateful if any readers of *Microcomputing* who have Saturn cards would regard with great suspicion any requests to copy their diskettes or manuals, and

let me have the name and address of anyone making such a request.

**James R. Florini, Ph. D.**  
Biology Department  
Syracuse University  
Syracuse, NY 13210

## On with Osborne

In response to Mr. Gordon's idea to form an Osborne user's group (see "Letters to the Editor," May 1982, p. 132), it sounds like a great idea. Put me in for a resounding YES.

In fact, I'd be happy to provide some time as an East Coast Organizer. Let me hear your thoughts.

I purchased the machine to get a lot of needed micro education. Now I'm wondering why I waited so long.

I often have the need for input from an educated user and do understand the valuable role we could play. There is only one thing left . . . Let's do it!

**Ron J. Lucchesi**  
10 Troll Lane  
Lake Telemark, NJ 07842

## Monitoring the Computer Marketplace

A thought—you have been a prime force in the proliferation of suppliers for the personal computer marketplace. Obviously, there will be some good dealers, some bad ones, and some understandable disagreements between suppliers and customers. Why not a column in one of your magazines that could help keep the consumers apprised of the current problems, and perhaps help resolve some of the disputes?

Such a column (call it Marketplace Interface) could be a big boon to both buyers and sellers. Those tried and true companies that have been reliable for several years could be given a few bouquets, which could certainly help their sales. For example, I recently wrote Apparatus with a question concerning NewDOS+ and the lowercase modifications. I got a prompt reply as I expected; unfortunately, the newcomer to personal computing doesn't know this about Apparatus; it is just another of several hundred suppliers.

An occasional market survey, an analysis of educational programs, book clubs, etc., could be a service to subscribers and advertisers.

Let me know what you think. Thanks, Wayne, and keep up the good work.

**Stephen F. Nowak**  
Barberton, OH

## Reply

Good idea, Stephen, but I'd like to see it as part of the letters section. I'm sure all readers would like to know about

firms which give outstanding service. And if you get stiffed by any firm, I ask that you write them a letter giving the details of the problem, with a copy to me. I'll follow up on it and try to see that things are made right . . . if I can. I don't always succeed, but my record is pretty good . . . **Wayne.**

## Starving for Software

I have an IBM PC and a fully configured Prism-132 printer. I continue to be fascinated by the myriad of ads I see in all of the wonderful computer magazines each month. However, most of the really fun programs (games, music synthesizers or graphics aids) seem to be aimed at owners of Apples or TRS-80s. Some of the problems (I am told) are due to the newness of the IBM as well as its nonstandard 8088 microprocessor and the lack of a "standard" operating system.

This letter is to urge all of you to work on powerful, user-friendly software which is capable of utilizing the full capabilities of the IBM for music and color, rather than sticking to "plain-vanilla" business applications. I would like to see the IBM DOS (in either the DOS version 1.05 or the new (soon to be released) DOS 2.00) become the standard operating system for the IBM and you can help!

There is a real market for software which will allow us IBM users to make full use of our IBM, as well as all the nifty features of a fully configured Prism printer, without being forced to resort to awkward home-made utility programs written in Basic.

Right now I am using Easy Writer-II for word processing. It has a beautiful editor, but it cannot even begin to make full use of the advanced features on my Prism, either for color or for graphics (or even for justifying copy using either proportional spacing or mixing type sizes on a single line).

Again let me urge you to branch out your software business to include the IBM. We are starving for good software and there are a lot of us. There is some kind of a myth floating around that IBM PCs are being bought only by corporations for business use. My IBM is owned by my corporation but I really bought it for me. I was unable to plunk down \$7000 in cash for a personal computer for me to play with in my spare time so I was faced with the dilemma of either buying an inexpensive (i.e., limited capability) computer for cash or to purchase an IBM (with dual disk drives, both color and monochrome monitors, and a fully configured Prism-132 printer) on an installment loan. But nobody would lend me \$7000 for a hobby computer. So, I lied to the loan company by telling them what they wanted to hear (that my corporation was buying a \$7000 computer system for business purposes). I suspect that lots of



IBM owners are in a similar boat. We really are a bunch of hobbyists who want all the games, graphics, and music abilities that Apple and Radio Shack owners enjoy. Please don't let us down.

**Bill Siebert  
Spencer, NY**

### A Plea for Price Listings

At long last I am the proud owner of an Epson MX-80 printer. But not until I'd been through a lot of trouble, expense, and waiting around the mailbox for correspondence. After many months of scouring the advertisements and circling little numbers in the back of magazines, and comparing features versus price, I ordered the MX-80 printer on December 2 from Omega Sales Co., Inc.

Due to the closeness of Christmas (and the associated tons of mail that flow through the postal system during that time of year), I decided it would be best to call in my order. And 20 days later the printer arrived by registered mail. Nothing different from the run-of-the-mill mail-order consumer. Right? Wrong.

What makes this particular purchase different is that it was done from West Germany. It started about a year ago when I decided that my SWTP PR-40 printer had outlived its usefulness. Although I had modified it to print 64 characters per line, which made it com-

patible with my VDM's output, the 4½ inch printing paper left a lot to be desired. Besides that, it's rather difficult to punch holes into and mount in a three-ring notebook binder.

After reading all the articles I could find on the various printers that were available, I ran into the recurring problem of the advertisers requesting the reader to call for the price. (This can be confirmed by looking through six months of back issues; you will find that 90 percent of the advertisers listed the price of the Epson-series printers as Scall). Are the advertisers aware of the fact that it costs \$4.38 a minute to call from here? And heaven help you if the person who answers the telephone doesn't know the price of the item you are inquiring about and puts you on hold while he goes to find someone who does know the current price. This happened to me twice even though I told them I was calling from Germany.

I'm fully aware that printers (and many other components) are undergoing rapid price changes, but even in the fliers that these companies put out, the consumers are asked to call for the most current price! Come on, guys, we can do better than that. There has to be a better way. Perhaps a list of the faster-moving items could be printed up on a weekly basis and given to the person who answers the telephone.

So, as I sit here looking at a \$463.35 bill for the printer and a \$73.28 telephone bill, I wonder if it would really hurt the advertisers to list the price for components that they advertise, even if it's not current at the time of publication. As you may know, we consumers like to be surprised when we call (or write) in and find the price has dropped from the one advertised.

**James A. Tomlinson  
USAF in Europe**

### Looking for a Language

I am an assembly-language programmer looking for a high level compiled language in which I can write commercial software.

The language must be able to generate independent ROMable code that implies variables are stored in a user defined area separate from the ROMable program code.

I am currently using a TRS-80 to run my software, but am considering switching to the Atari 400. I am looking for a language that is available on both Z-80 and 6502 machines; however, if a compiler is available for only one of the two machines, I would still consider it.

I would prefer a compiler for which I do not need to pay royalties for the compiled code I sell; however, I would be willing to pay for an excellent compiler that meets the above criteria.

Any help or advice sent would be greatly appreciated.

**Bart Narter  
Box 1203-B  
Nashville, TN 37235**

### Comments on Word Handler

I have some additional comments on your review of the Word Handler program (June 1982, p. 178).

The reviewer was correct that the number of pages in a document is not automatically displayed on screen, but there is a simple way to get the program to do this manually. When you name a document, the program has a provision for entering additional, extraneous information not needed for control purposes. This is accomplished by entering a semicolon after the document name. Any text thereafter will also be displayed on screen.

Whenever I finish writing a document, I note the number of pages, exit from the text and, before removing the diskette, go back and rename the document with the original name plus a semicolon and the number of pages I have written. Subsequently, the number of pages will always appear on screen. (Be careful, though, to include the semicolon and page numbers whenever you copy a document using Apple II's BRUN FID program on the DOS 3.3 system master. If you don't include all the information, the program will not run).

Users of Word Handler may also want to know that there is a way of moving the cursor forward a paragraph at a time, in preference to the normal control key operation that only permits forward movement by a word, a line or a page at a time. Instead of using the control key to move the cursor forward, just hit the return key.

It might also be noted that when you run Word Handler on an Apple III with an Apple II emulator program, you pick up two nice features. First, you get continuous forward and backward movement of the cursor without having to use the control key, as long as the cursor key remains depressed. Second, all uppercase functions are combined in the shift key, instead of being split between the shift key and escape key; or you can buy firmware from Videx for \$149, called Enhancer II. This will upgrade the Apple II keyboard functions.

As the reviewer noted, Word Handler is a very good program. Its biggest drawback—lack of a clear, detailed, step-by-step manual—has just been rectified with the publication of a revised manual by the manufacturer, Silicon Valley Systems (1625 El Camino Real, Belmont CA 94002).

I was told by the company that the new manual will be included with all future purchases of the Word Handler program. Those who already own the program can get the new manual for \$10. SVS is also about to bring out a companion spelling program that will contain some 85,000 words. This should be more than enough for most writers.

**Peter A. Corning  
Palo Alto, CA**

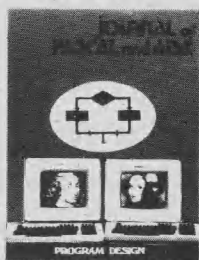
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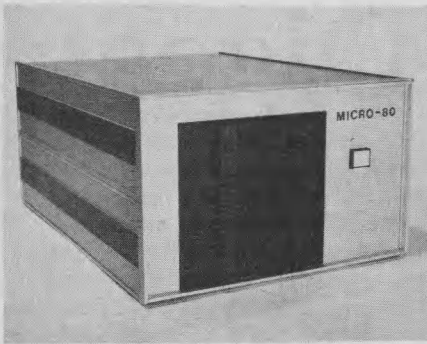
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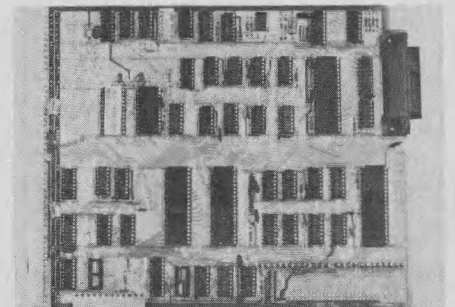
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# Micro Software Digest

Compiled by Dan Muse

*Micro Software Digest is a survey of software as reviewed in the microcomputer press.*

## T.I.M. III, Revision 5

*(Reviewed in Creative Computing, September 1982)*

**System Requirements:** 64K IBM PC, disk drive, monochrome display, parallel printer  
**Manufacturer:** Innovative Software, Inc., 9300 W. 110th St., Suite 380, Overland Park, KS 66210

**Price:** \$495

**Comments:** T.I.M. (Total Information Management) "assists the user in creating electronic files, which can be of great benefit to business and personal applications," the review says.

"T.I.M.'s list generation is well suited for printing mailing lists. The flexibility of the program allows for a variety of options," the review says.

"For small business or personal applications in which self-contained files need be updated only periodically, T.I.M. offers a vast amount of data manipulation power," according to the review. Reader Service number 432

## Ceemac 1.0

*(Reviewed in InfoWorld, July 19, 1982)*

**System Requirements:** Apple II Plus, DOS 3.3, 48K RAM, one disk drive, paddles or joystick

**Manufacturer:** Vagabond Enterprises, 1300 East Algonquin #3G, Schaumburg, IL 60195

**Price:** \$40

**Comments:** "Ceemac can provide you with the kind of fast-paced visuals that you might enjoy while listening to the Grateful Dead. They're not bad with Bach, either," the review says.

As art, Ceemac is mesmerizing; however, "as a programming language for the creation of art forms, Ceemac is somewhat tricky," the review says. "If you enjoy playing around with hexadecimal numbers, this program is definitely for you. If not, you're better off just watching," according to the review.

The only major flaw, according to the review, is the documentation. However, Ceemac is worth "learning about and exploring." Reader Service number 425

## Screen Director

*(Reviewed in Personal Computing, July 1982)*

**System Requirements:** Apple II or Apple III

**Manufacturer:** Business & Professional Software, 143 Binney St., Cambridge, MA 02124

**Price:** \$150 for Apple package; \$250 for Apple III

**Comments:** "Screen Director allows a personal computer to function like a slide projector with a carousel," the review says.

The package complements BPS's Apple Business Graphics. "Screen Director can also be used with almost any other program, such as VisiPlot, that produces graphic images on an Apple computer," the review says.

The displays created by Screen Director can be shown on an unlimited number of video monitors simultaneously. "The monitors may be of any size, from an eight-inch Panasonic to an eight-foot Advent or Nova-beam," the review says. Reader Service number 423.

## Monkey Wrench

*(Reviewed in InfoWorld, July 26, 1982)*

**System Requirements:** Atari 800

**Manufacturer:** Eastern House Software, 3239 Linda Drive, Winston-Salem, NC 27106

**Price:** \$49.95

**Comments:** "The Monkey Wrench lets you do many of the tasks that should have been built into the Atari originally, but were not," the review says.

"Its best features, a Basic program renumberer and an automatic line numberer, are worth the low price alone," according to the review.

Monkey Wrench runs with Basic and allows the user to input, update and edit Basic programs with greater ease. "The cartridge also contains a machine-language monitor for more advanced programmers."

Monkey Wrench's "unique design and low cost make it a perfect addition to almost any set of software tools," the review says. Reader Service number 421

## SOAP

*(Reviewed in InfoWorld, July 12, 1982)*

**System Requirements:** Apple II or II+, DOS 3.3, 48K RAM, disk II drive with controller.

**Manufacturer:** H&H Scientific, 13507 Pendleton St., Fort Washington, MD 20744

**Price:** \$250

**Comments:** "With SOAP (Stock Option Analysis Program) you can calculate and graph expected profits or losses on transactions involving up to three classes of options," the review says.

The program assumes the user has a basic understanding of the options market and of various options strategies. SOAP is easy to operate and "traps errors nicely."

"SOAP appears to be a good tutorial and useful tool for investors interested in put and call options using the Black-Scholes model." SOAP lives up to its promises, according to the review. Reader Service number 420

## MicroGantt Version 1.67

*(Reviewed in InfoWorld, July 5, 1982)*

**System Requirements:** 8080 or Z80 system or IBM PC, CP/M or DOS, 48K RAM, one single-sided 5¼- or 8-inch disk drive, printer, 80 or 132 columns

**Manufacturer:** Westico, 25 Van Zant St., Norwalk, CT 06855

**Price:** \$395

**Comments:** "MicroGantt provides a meaningful chart of the tasks to be performed in completing a complex project," the review says.

The program is easy to use once you understand the purpose of MicroGantt. On the whole the documentation contains good information, although "the theoretical explanation of Gantt charts and the instructions for using the program get a little mixed up in the manual explanation," the review says.

MicroGantt is "an interesting program and a useful tool," according to the review. Reader Service number 415



### VisiTran

(Reviewed in InfoWorld, August 2, 1982)

**System Requirements:** Apple II, Dos 3.3, 48K RAM, disk drive with controller

**Manufacturer:** PolyGlot, 264 N. Whisman Road, Mountain View, CA 94043

**Price:** \$99

**Comments:** "With the help of VisiTran you can move data residing in variables of any Applesoft Basic program into a VisiCalc Data File," according to the review.

"If you find programming in Basic easy, then VisiTran could become a very useful tool for you.

"You must be able to provide correct information about the variable values you want to transfer, in order to effectively use the program," according to the review. Reader Service number 430

### Automaniac, Execumaniac & GSW

(Reviewed in InfoWorld, August 2, 1982)

**System Requirements:** Apple II Plus, DOS 3.3, 48K RAM, one Disk II drive, Mountain Hardware Apple Clock

**Manufacturer:** Geegery Software Works, PO Box 8028, Des Moines, IA 50301

**Price:** \$100

**Comments:** "Automaniac and Executive work together nicely to automate routine tasks and keep the Apple working after hours," the review says.

The GSW Introl program "automates the printer and other electronic devices to support the Apple with its unattended work."

"The programs are all menu driven and easy to use," the review says. Reader Service number 434

### Solar System Astronomy

(Reviewed in Softalk, July 1982)

**System Requirements:** Apple II, with 48K, ROM Applesoft, and one disk drive.

**Manufacturer:** Cross Educational Software, Box 1536, Ruston, LA 71270

**Price:** \$30

**Comments:** "This program will not replace a school course in astronomy, but it will give you a good idea of what such a course is about," the review says.

"The information is nicely organized for teaching purposes, and it's presented one idea at a time." The text appears one character at a time accompanied by a series of ticks that simulate a typing sound. This sound is not distracting and "seems to add a kind of warmth to the program—a subliminal suggestion that, even though you are studying alone, the teacher is there with you," the review says. Reader Service number 418

### File Manager 800 Version 3F

(Reviewed in InfoWorld, July 26, 1982)

**System Requirements:** Atari 800 or 400, Atari DOS, 48K RAM, Atari 810 or Percom disk drive, printer (optional)

**Manufacturer:** Synapse Software, 820 Coventry Road, Kensington, CA 94707

**Price:** \$99.95

**Comments:** "File Manager 800 is a quality product that delivers on its promise to enable Atari 800 users to do efficient and effective record keeping on their computers."

The program is a disk-based, general-purpose record-keeping program. "FileManager 800 is an open-format program, so you determine the names, number and lengths of all record fields, within the overall constraints of the program," according to the review.

"FileManager 800 appears to have no equal among software that exists for its purpose for the Atari computer," the review says. Reader Service number 422

### Apple Juggler

(Reviewed in InfoWorld, July 5, 1982)

**System Requirements:** Apple III, 128K RAM, printer

**Manufacturer:** Quark Engineering, 1433 Williams, Suite 1102, Denver, CO 80218

**Price:** \$295

**Comments:** "Word Juggler is a solid text editor with no glaring faults. It is designed in a straightforward fashion and is easy to learn to use," the review says.

"You can master Word Juggler in one session," according to the review. Reader Service number 419

### DTL Basic

(Reviewed in Micro, August 1982)

**System Requirements:** 32K CBM/PET with CBM disk to compile. Some Basic and adequate memory to hold object file required at run-time. Both require a cassette port dongle (data key) protection device.

**Manufacturer:** Canadian Micro Distributors, 365 Main St., Milton, Ont. L9T1P7, Canada

**Price:** \$350; Rundongle \$50

**Comments:** This program "takes as input any normal Basic program file on disk and converts it into a machine-language equivalent," the review says. "The new file may be loaded and run normally."

DTL Basic is "nearly bug-free and easy to use," according to the review.

A major disadvantage, according to the review, "is the required run-time dongle (data key). Run-time protection should be a user option," the review says. Reader Service number 428

### Personal Investor IBM Version

(Reviewed in InfoWorld, July 19, 1982)

**System Requirements:** IBM PC, PC DOS 128K RAM, at least one disk drive, printer and modem optional

**Manufacturer:** PBL Corporation, 605 Harmony Circle Drive, Wayzata, MN 55391

**Price:** \$145

**Comments:** "The Personal Investor excels at letting you keep track of what stocks you own, how much they've appreciated and what the profits from any sales were," the review says.

"The Personal Investor is one of the few programs for the micro market that delivers as advertised. The user interface is simple enough for beginners and quick and easy enough for experienced users," the review says. Reader Service number 424

### Jinsam 8.0

(Reviewed in Creative Computing, August 1982)

**System Requirements:** PET 8032, 8050, 4040 disk drives

**Manufacturer:** Jini MicroSystems, Box 274 Kingsbridge Station, Riverdale, NY 10463

**Price:** \$495

**Comments:** "If you need a data base system, Jinsam deserves a good and careful look."

Jini MicroSystems offers "numerous accessory options for statistics, mailing labels . . . and so on," the review says.

The User's Guide is "clear and complete" and warns you about where you might get into trouble," the review says. Reader Service number 426

### Word Plus 1.0

(Reviewed in InfoWorld, August 2, 1982)

**System Requirements:** 8080 or Z80 system, CP/M 1.4 or later version, 32K RAM, eight-inch single-density disk drive

**Manufacturer:** Oasis Systems, 2765 Reynard Way, San Diego, CA 92103

**Price:** \$150

**Comments:** "Word Plus has several useful features that make it a front-runner among spelling-checker programs," the review says.

Word Plus may be valuable if you want to use a spelling checker for very large documents. "The dictionary file for Word Plus takes 136K of the 250K storage space on the eight-inch single-density. This will deter users with small systems but should pose no problem for double-density disk owners and users with eight-inch disk drives," the review says. Reader Service number 431



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## The New Step by Step

(Reviewed in Softalk, July 1982)

**System Requirements:** Apple II, with 48K ROM, Applesoft, and one disk drive.

**Manufacturer:** Program Design, 11 Idar Court, Greenwich, CT 06830

**Price:** \$79.95

**Comments:** Calling The New Step by Step a teaching program is "an understatement." You don't get just a program, you get a whole "teaching environment," according to the review.

"The Apple displays examples and demonstrations while a taped voice explains them," the review says. "Every few minutes this process stops and you are asked some simple questions about what you have just learned," according to the review.

"If you want to learn Basic or would like a little guidance and encouragement added to what you already know, then the way to go is Step by Step," the review says. Reader Service number 417

## Data Encryption System

(Reviewed in InfoWorld, August 2, 1982)

**System Requirements:** Apple II, DOS 3.3, 48K RAM, one or two disk drives

**Manufacturer:** Winner's Circle, 2420 Parker St., Berkeley, CA 94704

**Price:** \$60

**Comments:** "If you are planning to market a software product or circulate a product to software publishers, the Disk Encryption System is a must purchase," according to the review.

"The Disk Encryption System is designed to provide personalized copy protection for both the individual program author and software publishers," the review says. Reader Service number 433.

## Screen Writer

(Reviewed in Micro, August 1982)

**System Requirements:** Apple II (16K memory card optional)

**Manufacturer:** On-Line Systems, 3675 Mudge Ranch Road, Coarsegold, CA 93614

**Price:** \$125

**Comments:** Screen Writer "provides the owner of a minimal Apple with upper- and lowercase characters and an up-to-70-character display with no additional hardware," the review says. "This is done through use of the hi-res screen and generation of hi-res characters."

"The runoff program contains many of the most desirable print control features affecting margins, paging, text positioning, headings, hyphenation, and type style," according to the review. Reader Service number 429

## Senior Analyst

(Reviewed in InfoWorld, July 5, 1982)

**System Requirements:** Apple II Plus, DOS 3.3, 48K RAM, with Language Card or Memory Card, two disk drives, printer

**Manufacturer:** Business Solutions, Inc., 60 East Main St., Kings Park, NY 11754

**Price:** \$225

**Comments:** "Senior Analyst is an excellent product," according to the review.

Senior Analyst is not "just another spreadsheet package"; it is "a business-planning utility capable of creating budgets, forecasts or any type of model needed to analyze data."

The program is easy to use and well designed, the review says. Reader Service number 416

## Budgetmaster & Checkbalancer

(Reviewed in InfoWorld, August 2, 1982)

**System Requirements:** Atari 800, 32K RAM, disk drive or cassette tape recorder, optional printer

**Manufacturer:** Sunrise Software, PO Box 25621, Garfield Heights, OH 44125

**Price:** \$34.95 for Budgetmaster; \$16.95 for Checkbalancer; \$39.95 for both

**Comments:** Budgetmaster and Checkbalancer are designed to help you analyze your financial situation. It begins by "explaining a bit about budget theory." If you are a new user the program "allows you to select budget-category names or leave the original categories in place," according to the review.

"Once you understand all the ins and outs of the programs in this package, it is easy to use," the review says. Reader Service number 427

## Super Copy Disk III

(Reviewed in Peelings II, March 1982)

**System Requirements:** Apple II, 48K, Disk II, DOS 3.2 and 3.3

**Manufacturer:** Computer Data Services, PO Box 696, Amherst, NH 03075

**Price:** \$39.95

**Comments:** "Super Copy Disk III is a smooth, easy to use, powerful and well thought out utility for getting control characters out of your catalog names, 'undeleting' files, and removing DOS from a diskette," according to the review.

"The program can be used with a single drive; it is really designed for two," the review says.

"The program is completely self-prompting and obvious after only a few sessions," according to the review. Reader Service number 435



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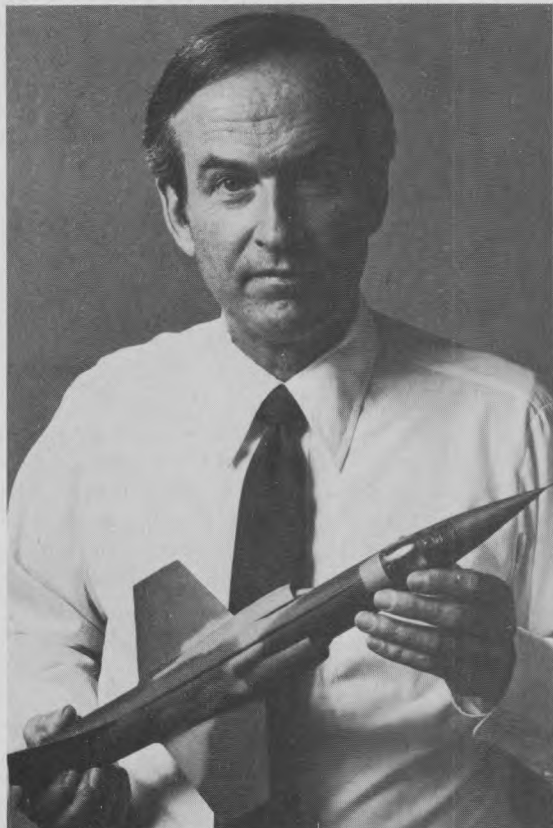
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# What You Didn't Know About NEC Spinwriter

*The Spinwriter's graphics features have remained hidden too long. Learn how you can generate matchless business graphics that are "better looking than output produced by dedicated pen plotters costing several times as much."*

By Timothy Stryker

Nippon Electric Co. (NEC) makes a fantastic thimblewheel printer called the Spinwriter. Many writers and small businessmen, myself among them, have found the Commodore CBM 8032, the NEC Spinwriter and the Wordpro4+ software package from Professional Software the ideal system for general word processing and business use.

But many Spinwriter users don't know how powerful a printer they have purchased—certainly features like 55 characters per second, unbeatable print quality and total reliability justify the price of the machine without looking any further. The

Spinwriter, however, has special graphics features that you can easily exploit, once you know how. By using these graphics features in conjunction with the normal printing capabilities of the machine, you can generate graphic output that's better looking than output produced by dedicated pen plotters costing several times as much. This is because the Spinwriter can integrate fully-formed character output with plotted output in a single drawing. Let's see how this works.

## Basic Functions

Fig. 1 shows a sample histogram

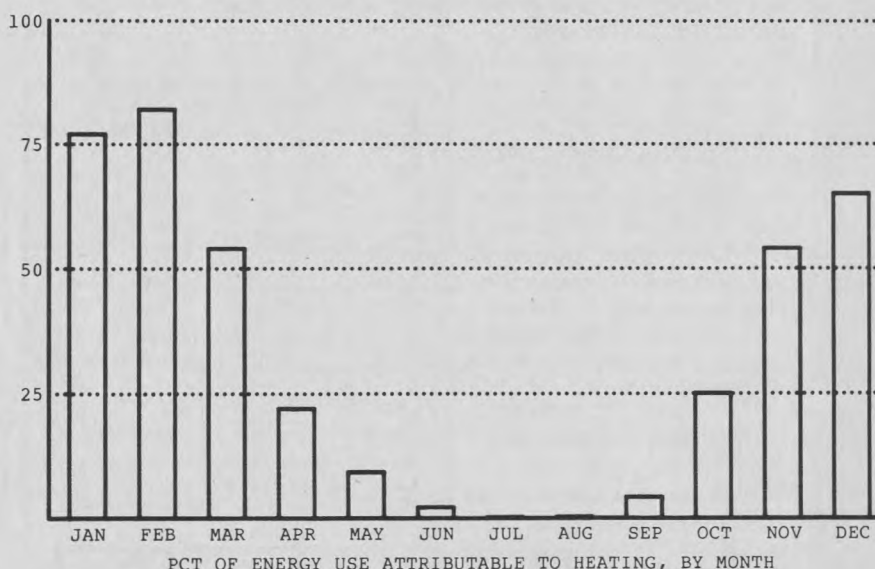


Fig. 1. A sample histogram generated by the NEC Spinwriter and Commodore computer.

generated by a program running on a Commodore computer. As you can imagine, it would be difficult, if not impossible, to produce output of this quality using an ordinary pen plotter. You'll need seven basic routines to generate a plot of this type:

1. *Initialize Printer*—This is the routine you would call before beginning to generate output. You would use this to define the origin of your coordinate system and to perform any necessary opening of logical devices, setup of printer modes, etc.

2. *Move Absolute to specified coordinates*—You would use this to move the print head to a particular spot on the paper when you (or your program) know in advance the absolute coordinates of the spot you wish to move to. The move is done with the "pen up"; i.e., no line is drawn on the paper as the print head moves to its new position.

3. *Move Relative by a specified (x,y) offset*—You would use this to move the print head by a given amount in x and y, relative to where the head was at the beginning of the move. As with Move Absolute, no line is drawn on the paper as the move is made.

4. *Draw Absolute to specified coordinates*—This routine behaves like Move Absolute except that the move

---

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is done with the "pen down"; i.e., a straight line is drawn from the current head position to the destination position.

5. *Draw Relative by a specified (x,y) offset*—As you might imagine, this routine draws a straight line from where it is to where it ends up (where it ends up being given in terms of a relative offset from where it started out).

6. *Print Text*—Given a character string, this routine just prints that string out, starting from wherever the print head is at the time the routine is called.

7. *Quit*—This routine performs whatever final cleanup may be necessary, such as closing logical devices, restoring the Spinwriter to its default mode, etc.

## Why RPL?

Routines to perform these functions could be written in any computer language. However, Basic is too slow to be of use for this purpose—lines are drawn from place to place on the Spinwriter using vast numbers of individual overlapping dots, and considerable amounts of program decision-making go into the precise location of each dot. To draw a single eight-inch-long line between two points would take Basic more than a minute. A faster programming language is needed.

I have developed a language called RPL, reviewed in this magazine by Robert Baker last February (p. 10). RPL is much faster than Basic—and it is a structured language. RPL thus has many features which suit it well to this sort of work: for example, RPL lets you name your routines with reasonable mnemonics, like DRWABS for Draw Absolute, and MOVREL for Move Relative. This makes remembering how to call these routines much easier than it is in Basic, where you must remember to GOSUB 500 to do one thing, and GOSUB 750 to do another (not to mention what happens when you renumber the lines of your program).

Listing 1 shows a set of RPL routines designed to fulfill the requirements laid out above. If you're not familiar with RPL, the listing will not make much sense to you at first, but perhaps you can pick up some of the flavor of the language as you go along. As you can see, there are various "labels" followed by double-colons in the listing, whose names suggest the functions we talked about before [e.g., Initialize Printer be-

comes INITNEC, Move Absolute becomes MOVABS, etc.]. The lines with nothing but the word REM on them are used to separate the English-language remarks from the segments of the RPL program code.

Listing 1 represents nothing more than a "subroutine library" in RPL; that is, the routines in this listing do nothing by themselves, but instead represent the seven basic, necessary functions discussed above. RPL allows you to set up a collection of routines like this independently of whatever programs you write to make use of them. Once compiled, these routines remain available for your use until you take action to eliminate them. Thus, Listing 2 shows the RPL program which, using these routines, creates the plot in Fig. 1.

Let's trace through the first few statements of Listing 2 to see how this works. The printer is initialized with -42 0 INITNEC &, which tells the printer to consider itself to be starting off at the (x,y) coordinate location (-42,0). The Spinwriter coordinate system uses units of 1/120th of an inch in the x, or horizontal, direction,

and units of 1/48th of an inch in the y, or vertical, direction. Thus, this first subroutine call sets the origin at 42/120ths, or 7/20ths, of an inch from the left margin.

Next, 0 0 MOVABS & moves the print head to the origin just defined. 840 0 DRWABS & tells the printer to draw a line from where it is (the origin) to the point (840,0); this draws the seven-inch line that is the baseline of the histogram. Then 0 0 MOVABS & is repeated, which brings us back to the origin, and then 0 200 DRWABS & draws the y-axis (the solid vertical line on the left side of the graph).

In a similar manner, lines 20 and 30 of Listing 2 label the y-axis with the numbers 25 through 100 and draw the horizontal dotted lines. (Each dot is formed by moving the print head to where the dot is needed and then entering 0 0 DRWREL & to draw a "line" of zero length.) Lines 40 and 50 of Listing 2 write the month names down below the x-axis. Note the use of the PRTTXT routine to output the actual text strings to the printer. Line 60 uses this same routine to output

```

1000      NEC SPINWRITER PLOTTING PACKAGE
1010      FOR USE BY ANY V3.0 OR V4.0 PET OR CBM RUNNING RPL
1020      TIMOTHY STRYKER
1030 *
1040      INITNEC: EXPECTS INITIAL-POSITION X AND Y COORDS ON STACK;
1050      POPS THEM AND INITIALIZES PRINTER.
1060 REM
1070      INITNEC:: NECY ! NECX ! OPENPRTR & HARDCOPY SYS
1080      PIXCTL PUSHST & PRINT RETURN
1090 REM
1100      MOVABS AND MOVREL: EXPECT X AND Y DESTINATION INFO ON STACK
1110      (MOVABS EXPECTS ABSOLUTE DESTINATION COORDS; MOVREL EXPECTS
1120      OFFSETS FROM CURRENT POSITION); BOTH ARE POPPED, AND PRINT
1130      HEAD IS MOVED TO SPECIFIED LOCATION (NO LINE IS DRAWN).
1140 REM
1150      MOVABS:: NECY @ - % NECX @ - % MOVREL & RETURN
1160      MOVREL:: # IF # NECY @ + NECY ! # 0 > IF 1 FOR RVSLF ESC 2 PRINT NEXT
1170      THEN 0 % - 1 FOR LF 1 PRINT NEXT END 0 END . # IF # NECX @ + NECX !
1180      # 0 > IF SPC THEN 0 % - BCKSPC END % 1 FOR # 1 PRINT NEXT END . RETURN
1190 REM
1200      DRWABS AND DRWREL: EXPECT X AND Y COORDINATE INFO ON STACK;
1210      SIMILAR TO MOVABS AND MOVREL EXCEPT THAT A LINE IS DRAWN AS
1220      THE PRINT HEAD MOVES TO THE SPECIFIED DESTINATION POSITION.
1230 REM
1240      DRWABS:: NECY @ - % NECX @ - % DRWREL & RETURN
1250      DRWREL:: # NECY @ + NECY ! # 0 > IF 1 THEN NOT 1 + 0 END DIRX POKE #
1260      DISTX ! ; NECX @ + NECX ! ; 0 > IF 1 THEN % NOT 1 + % 0 END DIRX POKE
1270      ; DISTX ! ; ; ; > IF . # END # 2 / #
1280      DRLOOP: BCKSPC DOT 2 PRINT DISTX @ DISTX @ OR IF 4 ^ - # 0 < IF 3 ^ +
1290      DISTX @ 1 - DISTX ! DIRX PEEK IF RVSLF ESC 2 THEN LF 1 END PRINT END
1300      % 5 ^ - # 0 < IF 3 ^ + DISTX @ 1 - DISTX ! DIRX PEEK IF SPC
1310      THEN BCKSPC END 1 PRINT END % DRLOOP GOTO END . . . . . RETURN
1320 REM
1330      PRTTXT: EXPECTS A CHARACTER STRING ON THE STACK; POPPS IT AND
1340      PRINTS IT OUT STARTING AT THE CURRENT PRINT HEAD POSITION.
1350 REM
1360      PRTTXT:: NRMCNTL PUSHST & PRINT # 12 * NECX @ + NECX ! PRINT
1370      PIXCTL PUSHST & PRINT RETURN
1380 REM
1390      QUITNEC: CALL THIS ROUTINE WHEN ALL FINISHED WITH THE SPINWRITER.
1400 REM
1410      QUITNEC:: 13 1 PRINT NRMCNTL PUSHST & PRINT CLOSEALL SYS RETURN
1420      PIXCTL: (6,27,93,65,27,93,80) NRMCNTL: (6,27,93,76,27,93,87)
1430      OPENPRTR: 0 217 POKE 1279 211 ! 4 210 POKE 65473 @ 3 + SYS RETURN
1440      HARDCOPY:: (162,4,76) [65481] :SOFTCOPY::65484: :CLOSEALL:65511:
1450      :LF:10: :RVSLF:57: :SPC:32: :BCKSPC:8: :ESC:27: :DOT:46:
1460      NECX::## NECY::## DIRX:# DIRY:# DISTX::## DISTY::##

```

Listing 1. RPL routines for creating Spinwriter graphics.

the histogram title.

Finally, lines 70 and 80 generate the histogram bars themselves. The height of each bar is given by the corresponding entry in ENERGYTBL. The whole process, once you know RPL, is remarkably simple and straightforward. Imagine the difficulty of generating a graph like this using assembly language!

### Another Example

Another common business use of computer graphics is generation of pie charts such as that shown in Fig. 2. Since RPL does not directly support floating-point mathematics, you might suppose that it is difficult to generate circles, angles and so forth using RPL. Not so. Listing 3 shows the program which gave rise to the plot in Fig. 2. In order to derive the sines and cosines needed for circles and angles, you just make use of the fact that Basic and RPL programs can coexist in memory: Let Basic handle the generation of sine/cosine information, and use RPL for printer control.

The REM in line 20 of Listing 3 acts as a separator between the Basic part

of the program and the RPL part. The RPL compiler thus considers the Basic statements in line 10 to be, as far as it is concerned, a set of English-language remarks. By the same token, Basic never has to deal with the RPL part from line 30 on, because it never gets that far. When you enter the Run command from Basic, line 10 simply pokes the values of the sines of the angles from 0 to 90 degrees into some scratchpad memory, starting at address 634, and then does a Go. (Go is a command that RPL adds to your

normal Basic vocabulary, saying, in effect, go execute the current RPL program, whatever it may be.)

Once the RPL part of the program begins executing, finding the sine of an angle between 0 and 90 degrees requires nothing more than adding the angle size to the number 634 and doing a peek to that location. To find sines and cosines of angles outside this range, use the fact that  $\sin(x) = \sin(360 + x)$ ,  $\sin(x + 180) = -\sin(x)$ ,  $\sin(x) = \sin(180 - x)$  if  $90 < x < 180$ , and that  $\cos(x) = \sin(90 + x)$ . The COS and SIN routines in lines 500 and 510 of Listing 3 handle all of these transformations, returning sines and cosines, scaled by a factor of 240, when given angles in units of degrees.

The routine labelled PIECHART, starting on line 200 of Listing 3, is the main pie-chart generator routine. It expects to be passed the address of a table of the sort found in lines 100 through 150, and it automatically generates the complete chart, including centering of legends and offsetting the last "piece" of the pie. In line 40 of Listing 3, the phrase PORTFOLIO PIECHART & is all that's needed to call for the generation of the chart—the rest of the program

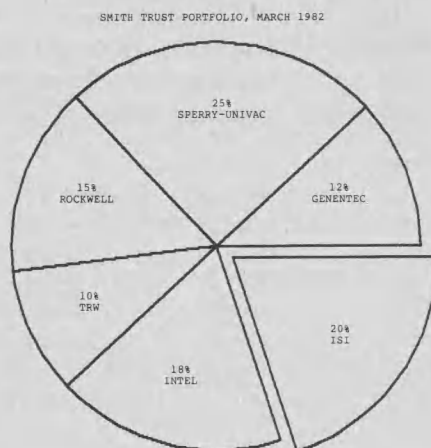


Fig. 2. A sample pie chart.

Circle 308 on Reader Service card.

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```

10 -42 0 INITNEC & 0 0 MOVABS & 840 0 DRWABS & 0 0 MOVABS & 0 200 DRWABS &
20 4 1 FOR -36 50 FN * 2 - MOVABS & 25 FN * STR$ 2 = IF 32 END 3 PRITXT &
30 0 50 FN * MOVABS & 105 1 FOR 8 0 MOVREL & 0 0 DRWREL & NEXT NEXT
40 MONTHBL 12 1 FOR 70 FN * 43 - -8 MOVABS & # PUSHST & PRITXT &
50 # PEEK + 1 + NEXT . 124 -20 MOVABS &
60 "PCT OF ENERGY USE ATTRIBUTABLE TO HEATING, BY MONTH" PRITXT &
70 20 0 MOVABS & ENERGYTBL 12 1 FOR 0 ; @ 2 * ; ; DRWREL & 36 0 DRWREL &
80 0 % - DRWREL & 34 0 MOVREL & 2 + NEXT . QUITNEC & STOP
100 MONTHBL: ["JAN", "FEB", "MAR", "APR", "MAY", "JUN"]
110      ["JUL", "AUG", "SEP", "OCT", "NOV", "DEC"]
120 ENERGYTBL: [77,82,54,22,9,2,0,0,4,25,54,65]

```

Listing 2. Program that uses RPL routines to plot Fig. 1.

```

10 FORI=0TO90:POKE634+I,INT(SIN(I*3.141592654/180)*240+.5):NEXT:GO
20 REM
30 -450 0 INITNEC & -198 160 MOVABS & "SMITH TRUST PORTFOLIO, MARCH 1982"
40 PRITXT & PORTFOLIO PIECHART & QUITNEC & STOP
100 PORTFOLIO: (12,"GENENTEC")
110      (25,"SPERRY-UNIVAC")
120      (15,"ROCKWELL")
130      (10,"TRW")
140      (18,"INTEL")
150      (20,"ISI")
200 PIECHART: 0 0 MOVABS & 0 ANGXY & DRWABS & 0 SLICE & # 0 DRWARC &
210 ; PEEK 2 / ; + ANGXY & 10 / % 10 / % MOVABS & 0 NECX 1 0 NECY 1
220 # ANGXY & DRWABS & ; PEEK ; + ; DRWARC & LSLICE & . . RETURN
230 SLICE: ; PEEK ; + 100 < IF LSLICE: ; PEEK 2 / ; + ANGXY & 2 * 3 / 4 +
240 % 2 * 3 / 18 - % MOVABS & ; PEEK STR$ 1 = IF 32 END 2 PRITXT &
250 "% PRITXT & ; 1 + PEEK 6 * -18 % - -8 MOVREL & ; 1 + PUSHST & PRITXT &
260 0 0 MOVABS & ; PEEK & # ANGXY & DRWABS & % 1 + # PEEK + 1 + %
270 SLICE GOTO END RETURN
300 DRWARC: # ANGXY & MOVABS & FOR FN ANGXY & DRWABS & NEXT RETURN
400 ANGXY: 36 * 5 + 10 / # COS & 3 * 2 / % SIN & 3 * 5 / RETURN
500 COS: 90 + SIN: 360 \ 0 ; 180 > IF . 180 - 1 END % # 90 >
510 IF 180 % - END 634 + PEEK % IF 0 % - END RETURN

```

Listing 3. Program in RPL that generates Fig. 2.



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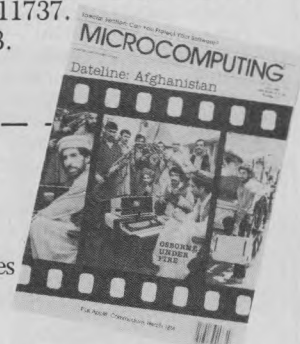
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Graphics applications are  
not limited to business.

mainline in lines 30 and 40 merely initializes the printer, prints out the pie chart title and calls QUITNEC when done.

This example brings out a couple of points of interest in connection with the use of the Spinwriter for graphics. Note the decreasing resolution in the perimeter of the pie toward the top and bottom of the circle, and the

contrast between the line separating the Rockwell slice for the TRW slice and the others. Because the vertical unit of distance in the Spinwriter is so much greater than the horizontal unit, lines with small nonzero slopes will have a distinctly grainy quality to them.

You should also take this difference between the horizontal and vertical units of distance into account if you want an aspect ratio of 1:1 between the vertical and horizontal axes, as is the case here. (If you didn't allow for this, the pie chart would come out elliptical.) The ratio of

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Another sample graphic generated by the Spinwriter.

```

10 -450 0 INITNEC & 7 0 FOR 25 FN * 412 - # 0 MOVABS &
20 10 FN * 5 + 0 ; HLFWAY & DRWREL & MIRRORX & ; 0 % - 0 DRWABS &
30 0 % 0 % - HLFWAY & DRWREL & MIRRORX & 0 DRWABS & NEXT -212 0 MOVABS &
40 0 -85 DRWABS & 212 0 DRWABS & 0 85 DRWABS & -212 0 DRWABS &
50 16 9 FOR 25 FN * 412 - # 0 MOVABS & 10 FN * 5 + 0 ; ; HLFWAY &
60 MOVREL & DRWABS & ; 0 % - 0 HLFWAY & DRWREL & MIRRORX & 0 % 0 % -
70 DRWABS & 0 HLFWAY & DRWREL & NEXT -126 -23 MOVABS &
80 CAPITALR PRTLET & CAPITALP PRTLET & CAPITALL PRTLET & QUITNEC & STOP
100 HLFWAY: NECY @ - 2 / % NECK @ - 2 / % RETURN
110 MIRRORX: 0 NECK @ - NECY @ MOVABS & RETURN
130 MIRRORX: NECX @ 0 NECY @ - MOVABS & RETURN
400 PRTLET: # 1 + % PEEK 1 FOR GETCOORDS & MOVREL & 5 + # 1 - PEEK 1
410 FOR GETCOORDS & DRWREL & 4 + NEXT NEXT GETCOORDS & MOVREL & . RETURN
450 GETCOORDS: # @ SCALEX * ; 2 + @ SCALEY * RETURN
460 :SCALEX:3: :SCALEY:1:
500 CAPITALR: (2)
510 [0,0] (11) [0,45,17,0,8,-8,0,-9,-8,-8,8,-20,-6,0,-8,20,-6,0,0,-20,-5,0]
520 [5,25] (6) [0,15,10,0,5,-5,0,-5,-5,-5,-10,0] [25,-25]
550 CAPITALP: (2)
560 [0,0] (8) [0,45,17,0,8,-8,0,-9,-8,-8,-12,0,0,-20,-5,0]
570 [5,25] (6) [0,15,10,0,5,-5,0,-5,-5,-5,-10,0] [25,-25]
600 CAPITALL: (1)
610 [0,0] (6) [0,45,5,0,0,-40,20,0,0,-5,-25,0] [30,0]

```

Listing 4. The recreational program.



1/48th to 1/120th is the same as a ratio of 5 to 2: thus, in order to generate true squares, circles, etc., the horizontal coordinates used must be a factor of 5/2 what they would otherwise be if the horizontal and vertical units of the Spinwriter were equal.

### Not Just Business

Naturally the graphics applications of the NEC Spinwriter are not limited to business purposes. Computer-generated art and big-letter sign making are two recreational application

areas that come quickly to mind. Fig. 3 shows the output of the program in Listing 4, just to give you a taste of the possibilities. With some additional effort, you could probably develop arbitrarily complex 3-D perspective projections, contour maps, automatic software flowcharting utilities and what-have-you, all using these same basic graphical-output routines. You could easily generate color plots by using ribbons of various colors, having your program pause at appropriate points to allow you to change ribbons from one color to the next.

The NEC Spinwriter is a truly so-

phisticated output device. I hope I've given you some idea of its capabilities, and that I've inspired you to learn more. If you have a Spinwriter but cannot use RPL because you don't have a Commodore computer, you can find technical details on the byte sequences required in Section 4 and Appendix D of the manual supplied with your printer. If you have both a Spinwriter and a Commodore computer, you are surely fortunate... feel free to write me for further information regarding the availability of RPL and more advanced Spinwriter-control software. ■



Fig. 3. Recreational NEC graphics.

```
10 REM BASIC PROGRAM TO GENERATE A 1"X1" SQUARE ON THE SPINWRITER
20 REM INITIALIZE PRINTER
30 OPEN 4,4 : FOR I = 1 TO 6 : READ X : PRINT#4,CHR$(X) : NEXT
40 DATA 27,93,65,27,93,80
50 REM MOVE AWAY FROM LEFT MARGIN
60 FOR I = 1 TO 240 : PRINT#4,CHR$(32) : NEXT
70 REM DRAW LEFT SIDE OF SQUARE GOING UP
80 FOR I = 1 TO 48 : PRINT#4,CHR$(46);CHR$(27);CHR$(57);CHR$(8) : NEXT
90 REM DRAW TOP SIDE OF SQUARE GOING RIGHT
100 FOR I = 1 TO 120 : PRINT#4,CHR$(46) : NEXT
110 REM DRAW RIGHT SIDE OF SQUARE GOING DOWN
120 FOR I = 1 TO 48 : PRINT#4,CHR$(46);CHR$(10);CHR$(8) : NEXT
130 REM DRAW BOTTOM SIDE OF SQUARE GOING LEFT
140 FOR I = 1 TO 120 : PRINT#4,CHR$(46);CHR$(8);CHR$(8) : NEXT
150 REM RETURN PRINTER TO NORMAL AND CLOSE DEVICE
160 FOR I = 1 TO 7 : READ X : PRINT#4,CHR$(X) : NEXT : CLOSE 4
170 DATA 13,27,93,76,27,93,87
180 END
```

*This Basic program for the Commodore computer draws a simple square box. It illustrates the complexity involved in implementing Spinwriter graphics in Basic.*

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# Super Problem-Solver

*For those of you who haven't taken the plunge yet, here's an introductory look at VisiCalc, a versatile business tool.*

By G. Michael Vose  
Microcomputing Technical Editor

**V**isiCalc is a name that has come to symbolize the power of microcomputers. It is a software tool so good that our industry can claim that this product's availability for a specif-

ic computer may be crucial to that computer's acceptance. The number of imitations—the Supercalcs, Easy Calcs, Versacalcs, etc.—testify to the popularity and versatility of the con-

ceptual tool known as the electronic spreadsheet.

The reason for this is simple: VisiCalc provides solutions. If you can define a problem numerically, you can use VisiCalc to solve it.

The uses of VisiCalc in business are legion. From its highly touted ability to perform "what-if" analysis to the simple task of record keeping, VisiCalc is as versatile as a high-level programming language like Basic, but far less difficult to master.

## What Is a Spreadsheet?

In accounting and finance, the use of a spreadsheet is analogous to a carpenter's use of a hammer. It is a fundamental tool for managing numbers—lots of numbers.

Ironically, there is no formal definition of spreadsheet. An accounting textbook, two unabridged dictionaries and a regular dictionary I consulted failed to list the term. If you go into a stationery store and ask for spreadsheets, the clerk will ask you if you mean a "columnar pad." Nevertheless, accountants use the term spreadsheet regularly.

A spreadsheet is composed of horizontal rows and vertical columns. The intersection of any row or column can be precisely defined by a pair of coordinates (conceptually, a mathematician would call a spreadsheet a "matrix"). For example, the intersection of row 10 and column C is defined as C10 on the spreadsheet.

To make the spreadsheet usable, it is a simple matter to draw the rows and columns so that each intersection

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Example 1. Retail markup template.



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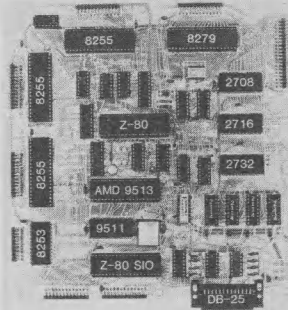
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Example 2. Template used to reprice jewelry.

is a small box. The boxes can hold numbers or words (words are used to label rows and columns). The individual rows and/or columns can be summed or averaged. The contents of one spreadsheet location can be the product of the contents of several others. The possible combinations are virtually limitless.

In business parlance, a spreadsheet is often called a ledger. A ledger is used primarily to record transactions—the purchase of goods and their resale to the buying public—and the overall record of a business's activity is its general ledger. Other specific ledgers would record debits and credits for the different activities that make up the business.

Accountants use two particular kinds of spreadsheets for almost every business—the balance sheet and the income statement. A balance sheet shows how the business stands at a given instant in time while the income statement details the path travelled between balance sheets.

## The Electronic Spreadsheet

VisiCalc and its clones have come to be known as electronic spreadsheets. Their use requires a microcomputer and this makes them superior to standard paper spreadsheets in a variety of ways. First, they take up virtually no physical space. Dozens of spreadsheets, known in VisiCalc parlance as templates, can be stored on a 5 $\frac{1}{4}$ -inch floppy disk. Second, and most important, an electronic spreadsheet is easily modified—change a data field and the result field automatically recalculates, with just a few keystrokes.

VisiCalc is easier to master than a formal computer programming language because it provides a blank form in which a user simply fills in the blanks. The user need only be concerned with his data—data that he is familiar and comfortable with. He

places this data onto the spreadsheet, places formulas or special functions, such as summation, into certain grid locations and receives a result. He can then change a data item and see how this change affects the result.

Movement around the spreadsheet, which on most eight-bit microcomputers will be 255 rows by 63 columns, is controlled by four cursor control keys. These four keys permit up, down, right and left movement. The computer's display screen serves as a window that can depict 12 rows and 7 columns of a spreadsheet at a time.

Once a spreadsheet is created, it can be printed out or saved onto a floppy disk to be retrieved and modified at a later date. In this way, important information can easily be stored with duplicate disks kept in different locations for safekeeping.

## VisiCalc in Business

In the following paragraphs, I'll explain three specific VisiCalc templates that might be used in a business. There are, however, literally hundreds of uses for a spreadsheet in a business. For example, as a magazine publishing house, Wayne Green, Inc., uses VisiCalc to track articles, figure average article cost, figure editorial cost versus production costs, break down mailing costs, analyze sales, figure editorial to advertising ratios, analyze circulation figures and figure batting averages for the company softball team.

Batting averages don't matter in a retail store, but establishing the markup for the products to be sold is a major factor in producing a profit. Example 1 shows a VisiCalc template to figure retail cost, based on profit needed and wholesale cost. To find out how much to charge for a widget, simply type in its wholesale cost and the amount of profit needed on the



sale of each widget. This template will calculate and display the required retail price. As the wholesale cost of widgets changes, you can change your retail cost to maintain your desired profit margin.

This template does nothing magic. It simply performs the math you would've used a calculator to do. What makes this template useful is that it does the calculations for you and displays the results in an easily read format. You can print out today's prices, hand them to a clerk and save the template using a disk filename coded to correspond to the current date. Over time, you can accumulate data on your prices that you can analyze at your leisure.

Example 2 (courtesy of Wing Associates, Box 161, Peterborough, NH) shows a similar template used to re-price jewelry pieces based on the current price of gold. The only number that you will change is the current price, indicated by the large arrow. Based on this number, the appropriate price for 14 karat, 10kt and 18kt gold pieces is shown by the bottom rows of numbers.

In order to visualize how this template works, look at Example 3. Here the price has been changed from \$420.00 to \$500.00. Note the corresponding changes, automatically calculated by VisiCalc, in the columns marked Surcharge Adjusted and Adjusted Price.

Once again, there is nothing dramatic about this simple template; nevertheless, it can more easily ensure that a jeweler makes a profit selling items containing gold.

### Getting More Complex

Example 4 shows a much more sophisticated VisiCalc application. This template is an automatic payroll calculator (based on a model in the book *VisiCalc Home and Office Companion*) that takes regular and overtime hours, computes a wage and then subtracts all necessary taxes for each employee. In order to subtract taxes, this template makes use of the VisiCalc function @LOOKUP. This function lets VisiCalc use a table of information as a reference for looking up specific data.

The payroll template is broken into three parts: Employee Records contains the vital information about each employee—name, hourly rate, marital status, number of exemptions; Payroll Register is the output portion of the template, except for the two col-

umns containing the hours worked; Tax Tables are the portion of the template used by the @LOOKUP function—this portion of the template would not normally be printed out.

To use this template, you simply type in the hours worked by each employee. The program calculates the gross and net check amounts along with all withholding information, which you print out and use to write your paychecks. Save the printout for your permanent records.

This template can be easily modified to keep track of yearly and quarterly totals of the individual payroll categories. At each pay period, the template is loaded from disk, the current hours are added, and the quarter-to-date and year-to-date totals are automatically updated. This new template is then saved on disk to be used again at the next pay period.

There are a variety of VisiCalc utilities that make it easier to accumulate or carry over data. One such program, called the Consolidator (Omega Software), lets you merge successive VisiCalc files on the same template. Utilities are available to graph and plot VisiCalc data, to use special printers, provide more memory for larger templates, and to increase screen widths to 80-column display.

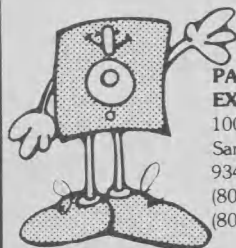
### Why VisiCalc?

These examples show the versatility and simplicity of VisiCalc. Nevertheless, it can be argued that a business program written in Basic or Pascal provides higher-quality results. A payroll program, for example, can calculate payrolls and print

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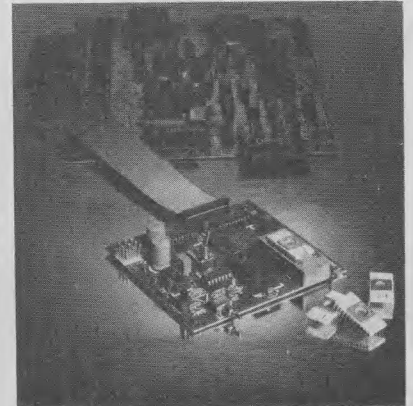
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out the paychecks. So why use VisiCalc if professionally prepared software can do a given job better?

For the small business, the intrinsic limitations of VisiCalc may be more than offset by the lower cost. Most implementations of VisiCalc and its clones cost from \$99 to \$299 (see Table 1) and are available for most microcomputers. Professional business software can cost from \$100 to \$1500 per package.

Professional business software, being generic in nature, is hard to customize for a specific business. The electronic spreadsheet programs, however, are easily tailored to specific applications.

One of the less recognized features of recent versions of VisiCalc is the

ability to store template data in DIF (data interchange format) files. These files arrange the data in a standard sequential data file that can then be accessed by programs other than VisiCalc. This makes it possible to use the same data for several different applications.

### Starting Small

The bottom line on the electronic spreadsheets simply may be that they are an excellent way to begin to understand the power of microcomputers. The simplicity of the genre may help cure newcomers to computers of their natural fear of the machine.

The 'Calcs may even allow people to enjoy working with numbers again!■

### GOLDCOST

Today's Date: June 18, 1982  
Today's Price \$ 500.00 <===== Change this number ONLY !!!  
(against base of \$ 400.00)  
Difference: \$ 100.00

Item #		Weight Factor	Surchrng Factor	Base Price	Surchrng Adjstmnt.	Adjust. Price
W435 14KT						
14KT Gold	Watch	12	.035	300	42.00	342.00
W435 10KT						
10KT Gold	Watch	10	.025	250	25.00	275.00
W435 18KT						
18KT Gold	Watch	14	.045	350	63.00	413.00

Example 3. This template reflects a change in the price of gold.

{{<<< Mini -Payroll Worksheet >>> OT Factor 1.5 FICA Rate 6.1  
Pay Pers 52

### Employee Records

Name of Employee	Rate	Single	Married	Exempts
Davis, David	5.00	1		1
Bombay, Jules	10.00		1	2
Huston, Arthur	15.00		1	2
Maloney, Eric	7.50	1		1

### Payroll Register

Employee	Reg Hrs	OT Hrs	Tot Hrs	Fwt	FICA	State	Gross	Net
Davis, David	5.00	0.00	5.00	0.00	1.53	0.14	25.00	23.33
Bombay, Jules	40.00	6.00	46.00	85.99	29.89	11.29	490.00	362.83
Huston, Arthur	40.00	0.00	40.00	121.38	36.60	14.84	300.00	227.98
Maloney, Eric	40.00	9.00	49.00	86.00	24.48	9.55	401.25	281.22
Totals	125.00	15.00	140.00	293.37	92.49	35.02	1516.25	1095.36

\*\*\*\*\*  
Tax Tables Value Per Exemptn 1000.00

Range	Single Subtract	Percent	Add	State Tax Exem Val	Rate
0.00	0.00	0.00	0.00	1000.00	
1420.00	1420.00	0.15	0.00		.025
3300.00	3300.00	0.18	282.00		
6000.00	6000.00	0.21	912.00		
10200.00	10200.00	0.26	1626.00		
14200.00	14200.00	0.30	2666.00		
17200.00	17200.00	0.34	3566.00		
22500.00	22500.00	0.39	5366.00		

Range	Married Subtract	Percent	Add
0.00	0.00	0.00	0.00
2400.00	2400.00	0.15	0.00
6600.00	6600.00	0.18	630.00
10900.00	10900.00	0.21	1404.00
15000.00	15000.00	0.24	2265.00
19200.00	19200.00	0.28	3273.00
23600.00	23600.00	0.32	4505.00
28900.00	28900.00	0.37	6201.00

Annual Less Ex	FWT Work Area Start Amt	Diff	Percent	Tax on %	Tot Tax	FWT Work Area Start Amt	Married Diff	Percent	Tax on %	Tot Tax	Final Tax Calc
300.00	0.00	300.00	0.00	0.00	0.00	0.00	300.00	0.00	0.00	0.00	0.00
23480.00	22500.00	980.00	0.39	302.20	5750.20	19200.00	4280.00	0.28	1198.40	4471.40	4471.40
29200.00	22500.00	6700.00	0.35	2613.00	7901.00	28900.00	300.00	0.37	111.00	6312.00	6312.00
19865.00	17200.00	2665.00	0.34	906.10	4472.10	19200.00	665.00	0.28	186.20	3459.20	4472.10

Example 4. Automatic payroll calculator.



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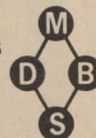
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Operating System \_\_\_\_\_

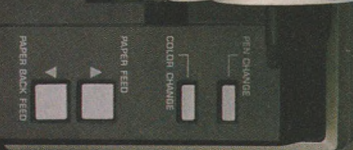
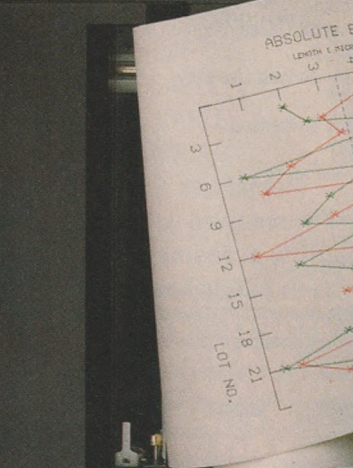
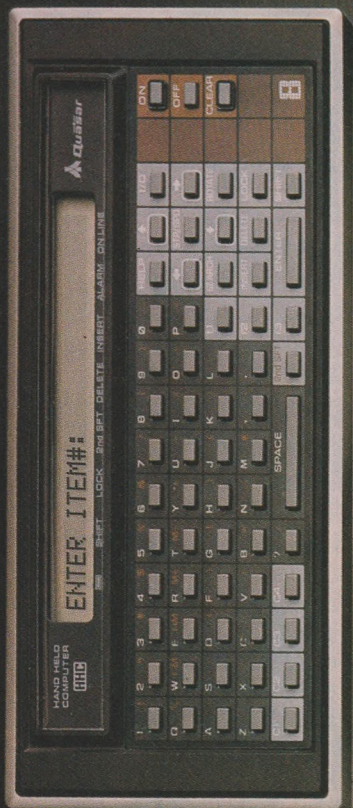
Programming Language \_\_\_\_\_

Application \_\_\_\_\_

5A402

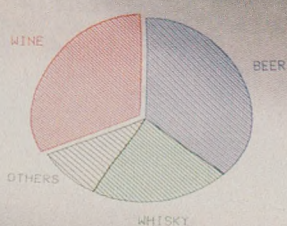
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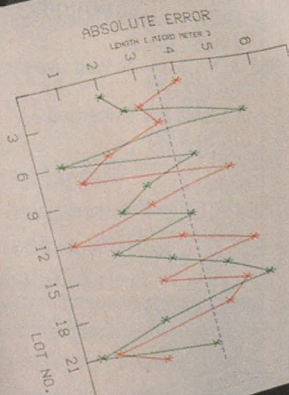
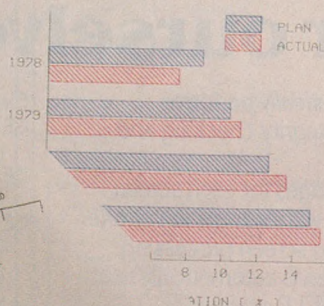


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WHISKY	28,633	30,723	7.3
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OTHERS	14,849	14,338	2.8
TOTAL	147,630	147,444	-0.1



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The term "financial statement analysis" refers to the art of analyzing and interpreting financial statements. Whether one is a potential creditor, a potential investor or a manager of a small business, the goal of financial statement analysis is the same—to provide a basis for rational decision making.

For example, a bank loan officer might have to decide whether to grant or deny a loan, and would be concerned with short-term liquidity and the collateral value of liquid assets. The investor would need to decide whether to buy or sell stock; therefore, the potential stockholder would be concerned with the long-term profitability and capital structure of the business. And for the small-business manager the decision would be to choose between continuing with a past practice or changing to a new procedure.

To analyze the financial condition of a business requires certain financial records. If the business has a good accounting system, these records will be readily available, but not all businesses keep good records. This omission is usually the first step to major financial problems and may be the reason the financial analysis is required. Many businesses continue operations each year with only minimum information regarding the profit (or loss) status of the company.

More often than not, any real understanding of the financial picture

develops only at income tax time. In many cases, this is far too late for corrective action for the new fiscal year since one quarter has already been

completed. Studies show that reasons for business failure can frequently be traced to the owner-manager's inability to see the direction in which his

*Listing 1. Financial analysis program in Applesoft Basic.*

```
0 REM THIS PROGRAM REQUIRES 7068 (1B9C) BYTES
1 GOSUB 248: REM INITIALIAZATION
2 GOTO 106: REM BRANCH PAST SUBROUTINES
3 REM RETURN ON SALES TEXT
4 PRINT "RETURN ON SALES IS DETERMINED BY"
5 PRINT "DIVIDING AFTER TAX PROFITS BY NET"
6 PRINT "SALES."
7 RETURN
8 PRINT "THIS MEANS FROM EACH SALES DOLLAR THE"
9 PRINT "FIRM MADE A CERTAIN AMOUNT OF CENTS"
10 PRINT "PROFIT."
11 GOSUB 104: RETURN
12 PRINT "RETURN ON INVESTMENT RELATES AFTER TAX"
13 PRINT "EARNINGS TO THE COMPANY'S TOTAL ASSET"
14 PRINT "BASE."
15 RETURN
16 PRINT "RETURN ON EQUITY RELATES AFTER TAX"
17 PRINT "EARNINGS TO STOCKHOLDERS EQUITY."
18 RETURN
19 PRINT "ONE SHOULD SETTLE FOR NO LESS THAN"
20 PRINT "10% RETURN BEFORE TAXES."
21 GOSUB 104: RETURN
22 PRINT "THIS RATIO IS DESIGNED TO MEASURE THE"
23 PRINT "RELATIONSHIP BETWEEN CURRENT ASSETS AND"
24 PRINT "CURRENT LIABILITIES."
25 RETURN
26 PRINT "IT IS A GOOD IDEA TO KEEP A 2 TO 1"
27 PRINT "RATIO FOR THE SAKE OF SOUND CASH FLOW."
28 GOSUB 104: RETURN
29 PRINT "THIS IS CALLED THE ACID TEST BY SOME."
30 PRINT "IT IS THE RATIO BETWEEN QUICK ASSETS"
31 PRINT "AND CURRENT LIABILITIES."
32 RETURN
33 PRINT "THIS TEST INDICATES THE ABILITY OF THE"
34 PRINT "FIRM TO MEET ITS OBLIGATIONS IF SOME"
35 PRINT "TYPE OF CATASTROPHE OCCURS."
36 GOSUB 104: RETURN
37 PRINT "DAILY SALES ARE THE NET ANNUAL SALES"
38 PRINT "FOR THE YEAR DIVIDED BY THE NUMBER OF"
39 PRINT "DAYS IN THE YEAR."
40 RETURN
41 PRINT "THIS RATIO IS USED TO CALCULATE THE"
```

More

Address correspondence to Dr. Corey D. Schou and Dr. Ronald S. Rubin, University of Central Florida, Department of Marketing, Orlando, FL 32816.

Listing continued.

```

42 PRINT "AVERAGE COLLECTION PERIOD."
43 GOSUB 104: RETURN
44 PRINT "THE AVERAGE COLLECTION PERIOD MEASURES"
45 PRINT "THE SPEED WITH WHICH RECEIVABLES ARE"
46 PRINT "TURNED INTO CASH."
47 RETURN
48 PRINT "IT IS USUALLY A GOOD POLICY TO GET"
49 PRINT "RID OF SLOW PAYING CUSTOMERS"
50 GOSUB 104: RETURN
51 PRINT "THIS SHOWS THE RATE AT WHICH THE"
52 PRINT "INVENTORY MOVES (AND THUS THE ACCOUNTS"
53 PRINT "RECEIVABLE)."
54 RETURN
55 PRINT "THIS SHOWS THE NUMBER OF DAYS"
56 PRINT "SALES ARE TIED UP IN INVENTORY."
57 RETURN
58 PRINT "THIS RATIO MAY BE USED TO COMPARE"
59 PRINT "ONE COMPANY'S PERFORMANCE WITH ANOTHER"
60 PRINT "OR WITH THE INDUSTRY."
61 RETURN
62 PRINT "A LOWER THAN AVERAGE OR DECLINING RATIO"
63 PRINT "SUGGESTS THE POSSIBILITY OF OVER BUYING"
64 PRINT "OR ACCUMULATION OF UNSALABLE GOODS."
65 GOSUB 104: RETURN
66 PRINT "THIS PROVIDES A GUIDE AS TO HOW"
67 PRINT "ACTIVELY INVESTED CAPITAL IS BEING PUT"
68 PRINT "TO WORK. IT MEASURES PROFITABILITY."
69 GOSUB 104: RETURN
70 PRINT "A LOW RATIO SHOWS UNPROFITABILITY USE"
71 PRINT "OF WORKING CAPITAL. A HIGH ONE"
72 PRINT "INDICATES A VULNERABILITY TO CREDITORS."
73 GOSUB 104: RETURN
74 PRINT "THIS MEANS THAT EACH DOLLAR INVESTED"

```

More

business is going. With up-to-date records, he could have foreseen impending disaster in time to take steps to avoid it.

The microcomputer provides an interactive arrangement between the financial analyst and his computer, enabling him to do financial analysis accurately and quickly. The step-by-step microcomputer model presented here is to evaluate the current financial condition of a business and develop a reasonable basis for forecasting. Various tools and techniques of financial statement analysis are used to make a reasonable assessment of the future financial condition of a company based on an analysis of its present and past financial condition.

Ratio analysis is one tool used in financial statement analysis. Generally, ratios allow the analyst to develop a set of statistics that reveal key financial characteristics of the business. In most instances, ratios are used in two major ways.

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• P402	Centronics 730/737 Line Printer II/IV	89
• P403	Epson MX70, MX80 or IBM Matrix	89
• P404	Epson MX100	99
• P405	IDS 560 or Prism Printer	109
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Listing continued.

```

75 PRINT "IN THE BUSINESS PRODUCES A CERTAIN"
76 PRINT "AMOUNT OF SALES."
77 GOSUB 104: RETURN
78 PRINT "LEVERAGE REFERS TO THE EXTENT TO WHICH"
79 PRINT "A COMPANY EMPLOYS DEBT CAPITAL TO"
80 PRINT "FINANCE ITS OPERATIONS."
81 RETURN
82 PRINT "AS THIS FIGURE APPROACHES 100 - THE"
83 PRINT "CREDITORS' INTEREST IN THE BUSINESS"
84 PRINT "APPROACHES THE OWNERS."
85 GOSUB 104: RETURN
86 PRINT "THE HIGHER THIS RATIO THE LESS THE"
87 PRINT "OWNERS CAPITAL IS AVAILABLE. IF IT IS"
88 PRINT "MORE THAN 75% OF WORTH IT MAY BE UN--"
89 PRINT "MANAGABLE."
90 GOSUB 104: RETURN
91 REM
92 LET T = LEN (R$(I)): REM SETS UP FRACTIONS ON EACH PAGE
93 VTAB 12: PRINT R$(I);
94 FOR X = 1 TO (39 - T): PRINT "-";: NEXT X
95 PRINT "-"
96 VTAB 11: HTAB T + 2: PRINT N$(I)
97 VTAB 13: HTAB T + 2: PRINT D$(I)
98 VTAB 15: PRINT N$(I);: INPUT NUM
99 VTAB 16: PRINT D$(I);: INPUT DEN
100 LET RA(I) = (INT ((NUM / DEN * 100) + .5) / 100)
101 VTAB 17: PRINT R$(I); " "; RA(I)
102 RETURN
103 GET A$: HOME : RETURN : REM CLEARS SCREEN AND PAUSES
104 INVERSE : VTAB 24: PRINT " PRESS ANY KEY ";: GET A$: NORMAL : RETU
RN : REM PAUSE
105 VTAB 19: RETURN
106 HOME : REM THE START OF THE MAIN
107 PRINT "SMALL BUSINESS FINANCIAL EVALUATION"
108 VTAB 5: HTAB 11: PRINT "RONALD S. RUBIN"
109 VTAB 8: HTAB 15: PRINT "COREY D. SCHOU"
110 GOSUB 104: HOME : VTAB 5
111 PRINT "THE TERM FINANCIAL STATEMENT ANALYSIS"
112 PRINT "REFERS TO THE ART OF INTERPRETING FIN--"
113 PRINT "ANCIAL STATEMENTS."
114 PRINT
115 PRINT "THE GOAL IS INFORMED DECISION MAKING"
116 REM -----
117 GOSUB 104
118 HOME
119 HTAB 10: PRINT "INDEX TO RATIOS"
120 FOR X = 1 TO 15
121 PRINT CHR$(X + 64); ". "; R$(X);
122 LET T = LEN (R$(X))
123 FOR Y = 1 TO (30 - T)
124 PRINT ". ";
125 NEXT Y
126 PRINT " "; RA(X)
127 NEXT X
128 VTAB 20: PRINT "PRESS THE LETTER OF YOUR CHOICE OR F TO PRINT.": GET A$
129 LET I = (ASC (A$) - 64)
130 IF I < 1 THEN 128
131 PR# 0
132 ON I GOSUB 137,145,152,160,168,176,184,192,199,206,214,221,227,234,242,271
133 IF I > 0 AND I < 17 GOTO 118
134 VTAB 22: PRINT "ENTER ONE ON THE LIST": GOTO 128
135 REM
136 REM RETURN ON SALES
137 REM -----
138 HOME : PRINT R$(I)
139 PRINT : GOSUB 4
140 GOSUB 92
141 VTAB 19: GOSUB 8
142 RETURN
143 REM
144 REM RETURN ON INVESTMENT
145 REM
146 REM

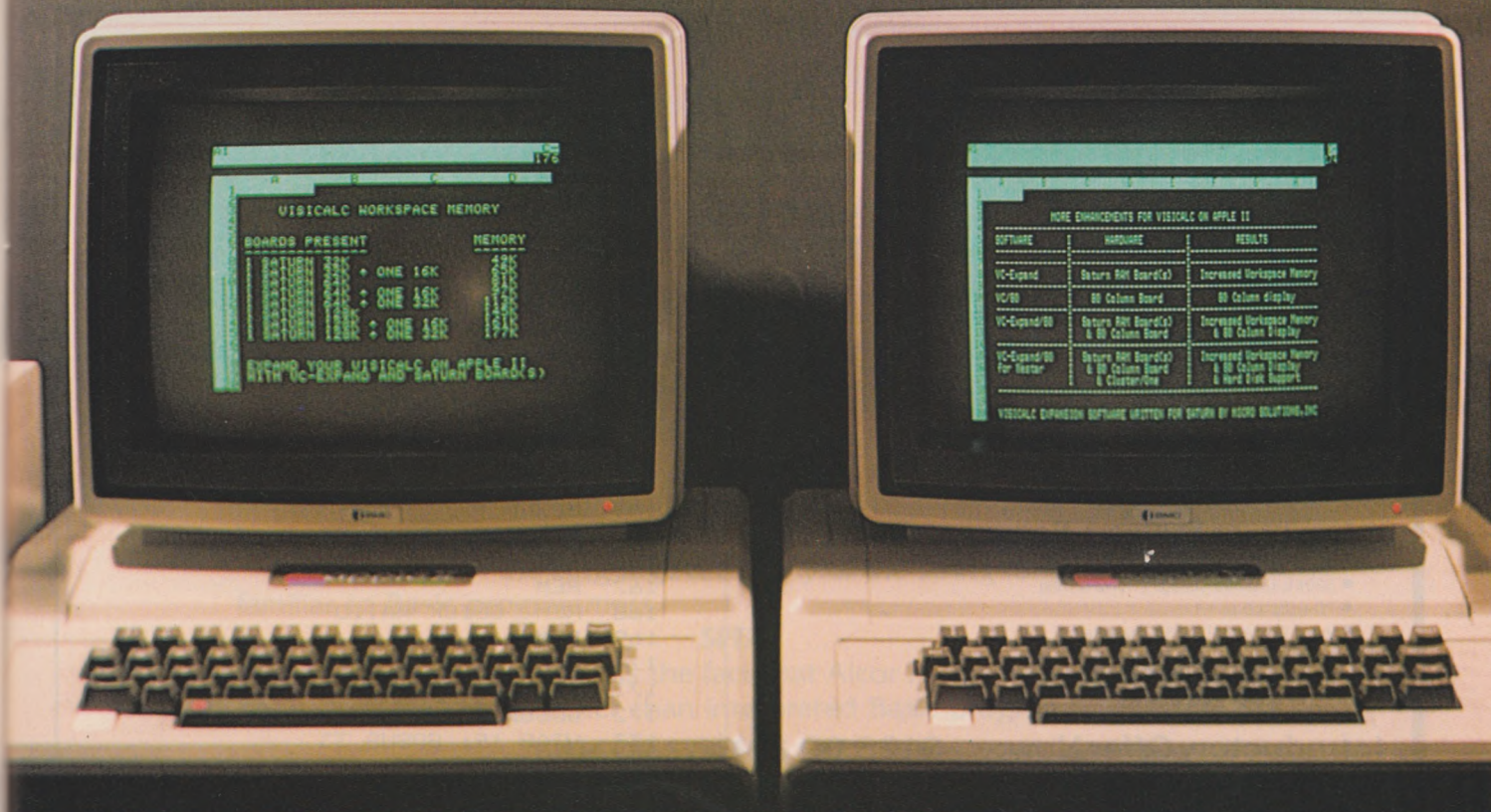
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statements are the basis and starting point for any financial analysis, they must be developed from existing records if they aren't available. This may be a long difficult process, especially if records have been kept on backs of envelopes or brown paper bags.

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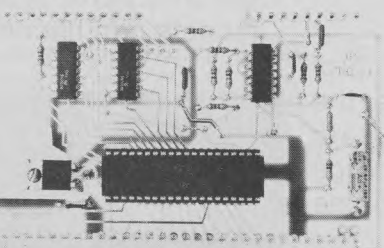


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Listing continued.

```

147 HOME : PRINT R$(I)
148 PRINT : GOSUB 12
149 GOSUB 92
150 GOSUB 104: RETURN
151 REM
152 REM RETURN ON EQUITY
153 REM
154 HOME : PRINT R$(I)
155 PRINT : GOSUB 16
156 GOSUB 92
157 VTAB 19: GOSUB 19
158 RETURN
159 REM
160 REM CURRENT RATIO
161 REM
162 HOME : PRINT R$(I)
163 PRINT : GOSUB 22
164 GOSUB 92
165 VTAB 19: GOSUB 26
166 RETURN
167 REM
168 REM QUICK RATIO
169 REM
170 HOME : PRINT R$(I)
171 PRINT : GOSUB 29
172 GOSUB 92
173 VTAB 19: GOSUB 33
174 RETURN
175 REM
176 REM DAILY SALES
177 REM
178 HOME : PRINT R$(I)
179 PRINT : GOSUB 37
180 GOSUB 92
181 VTAB 19: GOSUB 41
182 RETURN
183 REM
184 REM AVERAGE COLLECTION PERIOD
185 REM
186 HOME : PRINT R$(I)
187 PRINT : GOSUB 44
188 GOSUB 92
189 VTAB 19: GOSUB 48
190 RETURN
191 REM
192 REM INVENTOR TURNOVER
193 REM
194 HOME : PRINT R$(I)
195 PRINT : GOSUB 51
196 GOSUB 92
197 GOSUB 104: RETURN
198 REM
199 REM DAYS SALES IN INVENTORY
200 REM
201 HOME : PRINT R$(I)
202 PRINT : GOSUB 55
203 GOSUB 92
204 GOSUB 104: RETURN
205 REM
206 REM NET SALES TO INVENTORY
207 REM
208 HOME : PRINT R$(I)
209 PRINT : GOSUB 58
210 GOSUB 92
211 VTAB 19: GOSUB 62
212 RETURN
213 REM
214 REM NET SALES TO EQUITY
215 REM
216 HOME : PRINT R$(I)
217 GOSUB 92
218 VTAB 19: GOSUB 66
    
```

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Complete implementation of sets with up to 256 members.  
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### Extensions

OTHERWISE clause on case statements  
Identifiers may contain '\$' and '-' characters  
Automatic type conversion in arithmetic expressions and assignment statements  
Constants may be expressed in decimal or hexadecimal  
Characters within strings may be specified by ascii code.  
Allows non-printable characters in strings.  
Type transfer operator to override type matching  
ESCAPE allows exit from anywhere in a procedure  
LOCATION function returns the address of a variable  
SIZE function returns the amount of memory for a variable

### Full Screen Text Editor

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an excellent guide for preparing balance sheets and income statements, especially for those who have had limited experience in developing financial statements.

## Financial Ratios

Key financial ratios are commonly grouped into four major categories, according to the particular aspect of the company's financial condition that the ratios aim to highlight:

**Profitability**—Ratios designed to measure the earnings power and profitability of the company.

**Liquidity**—Ratios designed to measure the ability of the business to meet its liabilities as they come due.

**Operating efficiency**—Measures of the efficiency with which business resources are employed to earn a profit.

**Capital structure (leverage)**—Measures of the extent to which debt financing is employed by the business.

There is some difference of opinion as to how many financial ratios are significant; the number ranges from ten to 34. Small Business Management Series booklet no. 20, *Ratio Anal-*

*ysis for Small Business*, lists ten suggested key ratios, while the Dun and Bradstreet's *Key Business Ratios* publication lists 14.

After financial ratios are computed, they should be compared against the industry average for the particular type or similar type of business. Ratio sources are classified into two groups: those agencies which compile data for a number of individual industries, and those which confine their work to a particular industry or a group of related industries. The best known of the former are Dun and Bradstreet, Inc. and Robert Morris Associates. The latter group is composed of trade associations, publishers and trade magazines, specialized accounting firms and industrial companies (e.g., the National Cash Register Company). The SBA booklet no. 20 has a particularly good chapter on evaluating, comparing and interpreting financial ratios.

## Using the Program

The ratio analysis program (Listing 1) is written in Applesoft Basic, but we have tried our best to use those

commands and statements that are common to most versions of Basic.

The program has several unique features that increase its use to the small-business person. These features include:

- menu-driven instructions and results
- prompting of key variables for use in the appropriate formulas
- simplified hard copy of results

The menu (see Fig. 1) indicates the ratios available for analysis. You need only key in the letter representing the appropriate ratio and the formula for that ratio will appear on the display, prompting you to type the necessary information into the computer. When the figures are keyed in, the resulting ratio will appear with a brief "analysis" of the results. The analyst can then continue to choose and key in those ratios most appropriate for his analysis. When he has finished his selection, the resulting menu (see Fig. 2) will list the appropriate values that can be printed and saved for later use in comparing past figures with those calculated for the present time. If this comparison is

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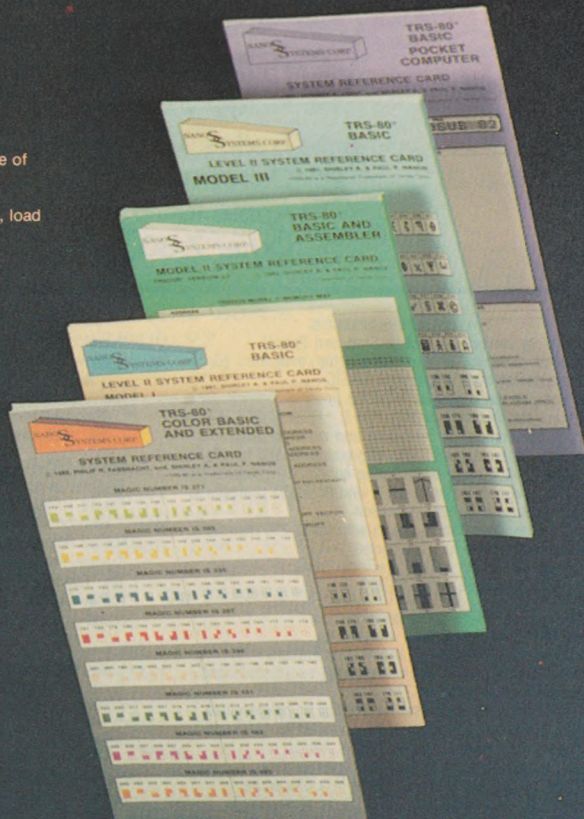


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Listing continued.

```

219 RETURN
220 REM
221 REM NET SALES TO NET WORKING CAPITAL
222 HOME : PRINT R$(I)
223 GOSUB 92
224 VTAB 19: GOSUB 70
225 RETURN
226 REM
227 REM NET SALES TO FIXED ASSETS
228 REM
229 HOME : PRINT R$(I)
230 GOSUB 92
231 VTAB 19: GOSUB 74
232 RETURN
233 REM
234 REM DEBT-EQUITY RATIO
235 REM
236 HOME : PRINT R$(I)
237 PRINT : GOSUB 78
238 GOSUB 92
239 VTAB 19: GOSUB 82
240 RETURN
241 REM
242 REM FIXED ASSETS TO EQUITY
243 REM
244 HOME : PRINT R$(I)
245 GOSUB 92
246 VTAB 19: GOSUB 86
247 RETURN
248 POKE 33,40
249 DIM R$(15),N$(15),D$(15)
250 DIM RA(15)
251 FOR X = 1 TO 15
252 READ R$(X),N$(X),D$(X)
253 NEXT X
254 RETURN
255 DATA RETURN ON SALES, EARNINGS AFTER TAX, NET SALES
256 DATA RETURN ON INVESTMENT, EARNINGS AFTER TAX, TOTAL ASSETS
257 DATA RETURN ON EQUITY, EARNINGS AFTER TAX, STOCKHOLDERS EQUITY
258 DATA CURRENT RATIO, CURRENT ASSETS,CURRENT LIABILITIES
259 DATA QUICK RATIO,CASH+MKT SEC +ACCT REC +CUR.,LIABILITIES
260 DATA DAILY SALES, NET SALES FOR YEAR, DAYS IN YEAR
261 DATA AVERAGE COLLECTIONS,ACCOUNTS RECEIVABLE,DAILY SALES
262 DATA INVENTORY TURNOVER,COST OF GOODS SOLD, AVERAGE INVEN.
263 DATA DAYS SALES IN INVENTORY, DAYS IN YEAR, INVEN. TURNOVER
264 DATA NET SALES TO INVENTORY,NET SALES,INVENTORY
265 DATA NET SALES TO EQUITY,NET SALES,STOCK H. EQUITY
266 DATA NET SALES TO WK CAP,NET SALES,NET WORKING CAP.
267 DATA NET SALES TO FIXED ASSETS,NET SALES,FIXED ASSETS
268 DATA DEBT-EQUITY RATIO,CURRENT LIABILITY,EQUITY
269 DATA FIXED ASSETS TO EQUITY,FIXED ASSETS,EQUITY
270 RETURN
271 PR# 1: RETURN
286 END
287 REM -----
288 REM ---VARIABLES USED IN PROGRAM----
289 REM --A$---TRANSIENT VARIABLE
290 REM --DE---THE DENOMINATOR FOR RATIO
291 REM --DI$---CONTAINS CHR$(4) DISK
292 REM ---D$---TEXT FOR DENOMINATOR
293 REM --I---CONTAINS CURRENTSECTION #
294 REM --MN---NAME OF MONTH FOR RECORD
295 REM --NU----THE NUMERATOR FOR RATIO
296 REM --N$---TEXT FOR NUMERATOR
297 REM --RA---ARRAY CONTAINING RATIOS
298 REM --R$-----TITLES FOR RATIOS
299 REM --T-----TEMP VARIABLE
300 REM --X-----INDEX FOR LOOPS
301 REM --Y-----INDEX FOR LOOPS
302 REM --YE$----YEAR FOR DISK FILE
303 REM COPYRIGHT COREY D. SCHOU 1981

```

made over a number of time periods, a simple trend may be observed. This will permit the analyst to see where the business has been and where it is headed.

### Profitability Ratios

Three commonly used measures of profitability are return on sales, return on investment (ROI) and return on equity (ROE). Return on sales is determined by dividing after tax profits by net sales, where net sales represents the dollar volume of sales less any returns, allowances and cash discounts:

Return on Sales =

$$\frac{\text{Earnings After Tax (Net Income)}}{\text{Net Sales}}$$

This means that from each sales dollar the firm made a certain amount of cents profit. This obviously is a strategic ratio in determining the overall profitability of the firm.

The second profitability ratio, return on investment, relates after tax earnings to the company's total asset base:

$$\text{ROI} = \frac{\text{Earnings After Tax}}{\text{Total Assets}}$$

The final profitability ratio, return on equity, relates after tax earnings to stockholders' equity (capital). Stock-

holders' equity normally excludes the effect of any intangible assets (goodwill, trademark, etc.) and is determined by deducting total liabilities and intangible assets from total assets. The ratio is computed as follows:

$$\text{ROE} = \frac{\text{Earnings After Tax}}{\text{Stockholders Equity}}$$

How much should a businessman earn on his investment? There are no hard and fast answers to this question. A great deal depends on the nature of the business, the expectations and ambitions of the owners, and the number of investment alternatives available to them at any particular time. The authors recommend that no small-business investor should settle for a return of less than 10 percent before taxes. He would be better off to consider investing in blue-chip stocks or savings certificates, where he can earn at least 10 percent.

### Liquidity Ratios

The most commonly used measure of liquidity is the current ratio, which is designed to measure the relationship, or balance, between current

assets and current liabilities (mainly accounts payable, current rates payable and the currently due portion of any long-term debt). The ratio is computed as follows:

$$\text{Current Ratio} = \frac{\text{Current Assets}}{\text{Current Liabilities}}$$

Generally, it's advisable for a small business to maintain a current ratio of at least 2 to 1 for the sake of a sound cash flow and a healthy financial condition. This is not necessarily a must—particularly if a major part of the current assets are in cash and readily collectible receivables—otherwise, 2 for 1 or better is a pretty good idea. This provides current liabilities with a 100 percent margin of safety. Since the current ratio indicates a relationship between two figures, in order to improve it you must either increase the current assets or decrease the current liabilities. For example, the following transactions will improve a current ratio:

- Payment of debts
- Additions to current assets resulting from term loans or other borrowing with a maturity of more than one year
- Additional investment in current assets
- Tax refunds
- Conversion of noncurrent assets into current assets
- Profits

On the other hand, the current ratio may be adversely affected by:

- Short-term borrowing or similar obligations
- Purchase of goods, materials and supplies on account
- Withdrawal of investment in current assets as dividend payments
- Reduction of fixed investment as a result of withdrawals
- The accrual of expenses, federal taxes, etc., if such items are set up to show both the expense and the offsetting liability of liability reserve
- Conversion of current assets into noncurrent assets

A second commonly used ratio, which is related to the current ratio, is called the quick ratio. It's also called the acid test and is designed to measure the relationship between so-called quick assets (assets that can be quickly converted to cash) and current liabilities. It's computed as follows:

$$\text{Quick ratio} = \frac{\text{Cash} + \text{Marketable Securities} + \text{Accounts Receivable}}{\text{Current Liabilities}}$$

This test indicates the ability of the firm to meet its obligations if some type of catastrophe occurs. The quick assets consist of items which represent a relatively stable dollar value, such as cash, and accounts receivable. A 1 to 1 ratio is usually considered favorable because it indicates that current liabilities are not exceeding the firm's ability to meet them in the short run.

Two final liquidity ratios measure the speed with which accounts receivable and inventories are converted into more liquid forms of current assets. The accounts receivable turnover ratio, which may be expressed in terms of annual turnover rates on the number of days' sales outstanding as receivables (also called the average collection period), measure the speed with which receivables are turned into cash:

$$\text{Daily Sales} = \frac{\text{Net Sales for Year}}{365 \text{ Days a Year}}$$

$$\text{Average Collection Period} = \frac{\text{Accounts Receivable}}{\text{Daily Sales}}$$

If your trade terms are 30 days, receivables are outstanding, slow collections are indicated, and immediate action must be taken to speed up the collection of overdue accounts. Since the collection period does not pinpoint the condition of individual accounts, at this stage the manager should request that his accountant furnish him with an aging schedule of his accounts receivable. This can be done by dividing them under such headings as "Overdue from 1 to 30 days," "31 to 60 days," "61 to 90 days."

Although it is usually a good policy to get rid of chronically slow-paying accounts, it is not a good idea to cut off every overdue customer, as some of these customers provide volume. A too-rigid collection policy can mean a loss of business and a failure to cultivate future profitable outlets. In policing accounts receivable, a major factor to be considered is the markup realized from a particular account. It is obvious that a business which enjoys a high markup on its sales can afford to be much more lenient in its collections than one which does not.

The inventory turnover ratio, which may be expressed in terms of annual turnover rates or the number of days' sales tied up in inventories,

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Inventory Control.....Payroll.....Bookkeeping System.....Stock Calculations.....

Checkbook Maintenance.....Accounts Receivable.....Accounts Payable.....

### BUSINESS 100 PROGRAM LIST

#### NAME

#### DESCRIPTION

1 RULE78	Interest Apportionment by Rule of the 78's
2 ANNU1	Annuity computation program
3 DATE	Time between dates
4 DAYYEAR	Day of year a particular date falls on
5 LEASEINT	Interest rate on lease
6 BREAKVEN	Breakeven analysis
7 DEPRSL	Straightline depreciation
8 DEPRSY	Sum of the digits depreciation
9 DEPRDB	Declining balance depreciation
10 DEPRDDB	Double declining balance depreciation
11 TAXDEP	Cash flow vs. depreciation tables
12 CHECK2	Prints NEBS checks along with daily register
13 CHECKBK1	Checkbook maintenance program
14 MORTGAGE/A	Mortgage amortization table
15 MULTMON	Computes time needed for money to double, triple, etc.
16 SALVAGE	Determines salvage value of an investment
17 RRVARIN	Rate of return on investment with variable inflows
18 RRCONST	Rate of return on investment with constant inflows
19 EFFECT	Effective interest rate of a loan
20 FVAL	Future value of an investment (compound interest)
21 PVAL	Present value of a future amount
22 LOANPAY	Amount of payment on a loan
23 REGWITH	Equal withdrawals from investment to leave 0 over
24 SIMPDISK	Simple discount analysis
25 DATEVAL	Equivalent & nonequivalent dated values for oblig.
26 ANNUDEF	Present value of deferred annuities
27 MARKUP	% Markup analysis for items
28 SINKFUND	Sinking fund amortization program
29 BONDDVAL	Value of a bond
30 DEPLET	Depletion analysis
31 BLACKSH	Black Scholes options analysis
32 STOCVAL1	Expected return on stock via discounts dividends
33 WARVAL	Value of a warrant
34 BONDDVAL2	Value of a bond
35 EPSEST	Estimate of future earnings per share for company
36 BETAALPH	Computes alpha and beta variables for stock
37 SHARPE1	Portfolio selection model-i.e. what stocks to hold
38 OPTWRITE	Option writing computations
39 RTVAL	Value of a right
40 EXPVAL	Expected value analysis
41 BAYES	Bayesian decisions
42 VALPRINF	Value of perfect information
43 VALADINF	Value of additional information
44 UTILITY	Derives utility function
45 SIMPLEX	Linear programming solution by simplex method
46 TRANS	Transportation method for linear programming
47 EOQ	Economic order quantity inventory model
48 QUEUE1	Single server queueing (waiting line) model
49 CVP	Cost-volume-profit analysis
50 CONDPFOT	Conditional profit tables
51 OPTLOSS	Opportunity loss tables
52 FQOQ	Fixed quantity economic order quantity model
53 FQEOQSH	As above but with shortages permitted
54 FQEOQPB	As above but with quantity price breaks
55 FQEOQCB	Cost-benefit waiting line analysis
56 NCFANAL	Net cash-flow analysis for simple investment
57 PROFIND	Profitability index of a project
58 CAP1	Cap. Asset Pr. Model analysis of project

59 WACC	Weighted average cost of capital
60 COMBAL	True rate on loan with compensating bal. required
61 DISCBAL	True rate on discounted loan
62 MERGANAL	Merger analysis computations
63 FINRAT	Financial ratios for a firm
64 NPV	Net present value of project
65 PRINDLAS	Laspeyres price index
66 PRINDPA	Paasche price index
67 SEASIND	Constructs seasonal quantity indices for company
68 TIMETR	Time series analysis linear trend
69 TIMEMOV	Time series analysis moving average trend
70 FUPRINF	Future price estimation with inflation
71 MAILPAC	Mailing list system
72 LETWRT	Letter writing system-links with MAILPAC
73 SORT3	Sorts list of names
74 LABEL1	Shipping label maker
75 LABEL2	Name label maker
76 BUSBJUD	DOE business bookkeeping system
77 TIMECLCK	Computes weeks total hours from timeclock info.
78 ACCTPAY	In memory accounts payable system-storage permitted
79 INVOICE	Generate invoice on screen and print on printer
80 INVENT2	In memory inventory control system
81 TELDIR	Computerized telephone directory
82 TIMUSAN	Time use analysis
83 ASSIGN	Use of assignment algorithm for optimal job assign.
84 ACCTREC	In memory accounts receivable system-storage ok
85 TERMSPAY	Compares 3 methods of repayment of loans
86 PAYNET	Computes gross pay required for given net
87 SELLPR	Computes selling price for given after tax amount
88 ARBCOMP	Arbitrage computations
89 DEPRSF	Sinking fund depreciation
90 UPSZONE	Finds UPS zones from zip code
91 ENVELOPE	Types envelope including return address
92 AUTOEXP	Automobile expense analysis
93 INSFILE	Insurance policy file
94 PAYROLL2	In memory payroll system
95 DILANAL	Dilution analysis
96 LOANAFDD	Loan amount a borrower can afford
97 RENTPRCH	Purchase price for rental property
98 SALELEAS	Sale-leaseback analysis
99 RRCONVBD	Investor's rate of return on convertible bond
100 PORTVAL9	Stock market portfolio storage-valuation program

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measures the speed with which inventories are turned into sales (and thus accounts receivable):

$$\text{Inventory Turnover} = \frac{\text{Cost of Goods Sold}}{\text{Average Inventory}}$$

$$\text{Days' Sales in Inventory} = \frac{365 \text{ Days}}{\text{Inventory Turnover}}$$

## Operating Efficiency Ratios

Operating efficiency ratios provide measures of the relationship between annual sales and investments in various classes of asset accounts. The first ratio presented is sales to inventory. It lets you compare one company's performance with another or with the industry.

$$\text{Net Sales to Inventory} = \frac{\text{Net Sales}}{\text{Inventory}}$$

A lower than average or declining ratio suggests the possibility of overbuying on an accumulation of unsalable goods. A high inventory-turnover ratio, although desirable, should not always be taken at face value, because it could be the result of inadequate inventory levels. Low, unprofitable prices can also increase inventory turnover without improving a firm's profitability.

Other ratios are:

$$\text{Net Sales to Equity} = \frac{\text{Net Sales}}{\text{Stockholder's Equity}}$$

This provides a guide as to how actively invested capital is being put to work by indicating its turnover during a period. It helps to measure the profitability of the investment.

New Sales to Net Working Capital =

$$\frac{\text{Net Sales}}{\text{Net Working Capital}}$$

A low ratio shows unprofitable use of working capital; a high one, vulnerability to creditors. The importance of maintaining an adequate amount of working capital in relation to the amount of annual sales being financed cannot be overemphasized.

$$\text{Net Sales to Fixed Assets} = \frac{\text{Net Sales}}{\text{Fixed Assets}}$$

This means that each dollar invested in the business produces blank amount of sales. If this figure is lower than the sales/fixed assets ratio of comparable enterprises, it is obvious that this company is not using its assets as efficiently as its competitors are using theirs.

## Capital Structure (Leverage) Ratios

In general, the term "leverage" refers to the extent to which a company employs debt capital to finance its operations. The more debt employed by a company, the more highly leveraged it is said to be. The first ratio to be examined is referred to as the debt-equity ratio:

$$\text{Debt-Equity Ratio} = \frac{\text{Current Liabilities}}{\text{Equity}}$$

As this figure approaches 100, the creditors' interest in the business assets approaches the owner's. How much debt should a businessman incur? There are no rigid rules to answer this question. Although a low percentage of debt means fewer headaches for management, it may also mean that management is neglecting opportunities to use more low-cost funds to enhance the return on the owner's equity.

$$\text{Fixed Assets to Equity} = \frac{\text{Fixed Assets}}{\text{Equity}}$$

The higher this ratio, the less the owner's capital is available for use as working capital, or to meet debts. If it exceeds 75 percent of worth, they may become unmanageable.

## Conclusion

Performing a ratio analysis is likely to repay the time and effort many times over. Many businesses have been able to place their operations on a sounder basis by examining the various ratios. Identification of problem areas can be made simpler by examining "standards" such as are provided by ratios. After making the appro-

priate comparisons, you should earmark those items from the financial statements which appear seriously out of line with the "trade average" or the "rule of thumb" measure.

The first reaction may be to take some drastic step to correct the situation. But, more fitting would be a careful reflection as to the possible cause of why the item is seriously out of line with the "standards." Remember, the typical ratios may not represent par. The industry ratios represent an average; they represent the performance of the least-efficient and the most-efficient business. Therefore, the objective of the small-businessperson should be to adjust operations so that they are at least as good as, but preferably better than, the typical operating ratios. ■

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# The Enhanced 80

*Build the LNW-80, and the vast library of TRS-80 software will become accessible to you.*

By William G. Eisinger

For some time I've been enviously eyeing the vast quantities of TRS-80 software. Everything from Space Invaders to Videotex is available, and at very affordable prices. I found that my 8080-based homebrew S-100 machine did not satisfy my needs. So I decided to buy either a TRS-80 or a similar machine such as the PMC-80, capable of running TRS-80 programs.

Enter the LNW-80.

LNW Research Corporation has been marketing a bare expansion board for the TRS-80 for some time. They've continued the same bare-board philosophy with the LNW-80 computer (the LNW-80 is also available assembled and tested).

The LNW-80 seemed to be TRS-80 hardware- and software-compatible, portable and easy to use (a plus with my wife—a school teacher who intends to use the LNW-80 in her classroom). And it was less expensive than buying a TRS-80 Model III.

In addition to the standard TRS-80 features, the LNW-80 lists as standard the following:

- Selectable 4 MHz/1.77 MHz Z-80A speed
- 500/1000 bits-per-second cassette interface
- 24 by 80 video display capability if desired
- Upper- and lowercase
- Reverse video

- 63-key keyboard with numeric pad
- High-resolution b/w graphics 480 by 192
- High-resolution color graphics (NTSC) 128 by 192 in eight colors
- High-resolution color graphics (RGB) 384 by 192 in eight colors

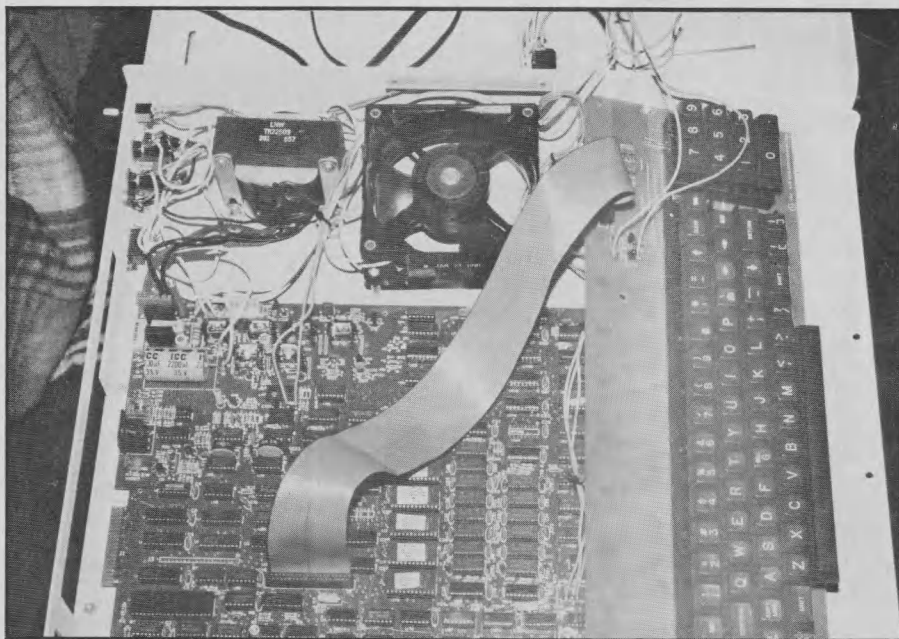
I ordered the bareboard from LNW for \$89.95. It soon arrived, appearing to be an excellent quality 10 by 16 inch, double-sided, solder-masked and silk-screened, glass epoxy board.

The LNW-80 is no project for beginning kit builders. I consider myself a fairly accomplished tinkerer with more than a few years of constructing amateur radio gear and computer hardware, but this was one of the more difficult projects I've undertaken.

The complexity of the project lies primarily with the number of parts involved. More than 120 ICs, 140 capacitors and 130 resistors are crammed onto the board, along with miscellaneous diodes, transistors and power supply components.

The manual, which was a preliminary version, left much to be desired. The first three pages consisted of errata sheets that required some study. The remainder of the manual contained parts lists, general assembly instructions, technical data and a description of the high-density graphics format and software requirements.

The manual recommends that the



*Interior view with all components in place.*

*Address correspondence to William G. Eisinger, 11510 Alejandro, Boise, ID 83709.*



user buy both the *TRS-80 Microcomputer Technical Reference Handbook* and the *Level II Basic Reference Manual*. I heartily agree with that recommendation: no description of Level II Basic, and very little description of electrical circuits, was supplied in the manual.

Once I had the circuit board in hand, I had to acquire the components. LNW supplies a keyboard kit for \$84.95, which I also ordered. The keyboard is mounted on a single-sided PC board with a rather large amount of jumpers. Since the TRS-80 uses a matrix scan type of keyboard with software decoding, very few components are required aside from the keys. This results in a very simple assembly and interface with the main circuit board.

I bought most of the remaining components from various mail-order suppliers. A few of the hard-to-find parts were supplied by LNW at competitive prices. When buying the components, you can save significantly by shopping around for the best bargains. Since I built my LNW-80 at least one supplier has begun offering a complete kit of parts at a reasonable cost.

The majority of components used are standard TTL-type integrated circuits. There are 16K bytes of main memory and another 16K of graphics memory using 4116-type dynamic memory chips.

The Level II Basic read-only memory (ROM) chips can be bought either from Radio Shack or LNW for \$120. The ROMs supplied by Radio Shack are either a two- or three-chip set, depending on the type, and those supplied by LNW are a six-chip set, programmed onto standard 2716 erasable-programmable ROM chips. Using jumpers, the board can be configured for any of the ROM types available.

Since there are virtually no assembly instructions other than the errata and instructions for configuring the board for various ROM types, ease of assembly is going to vary directly with the experience of the builder. Parts placement and density is similar to that of many other kits and bareboards currently on the market. There were no surprises or unexpected hitches during construction, with the exception of insufficient quantities of certain parts. The manual contained two separate lists of components, one listing parts by component type and quantity, and the other by device number and com-



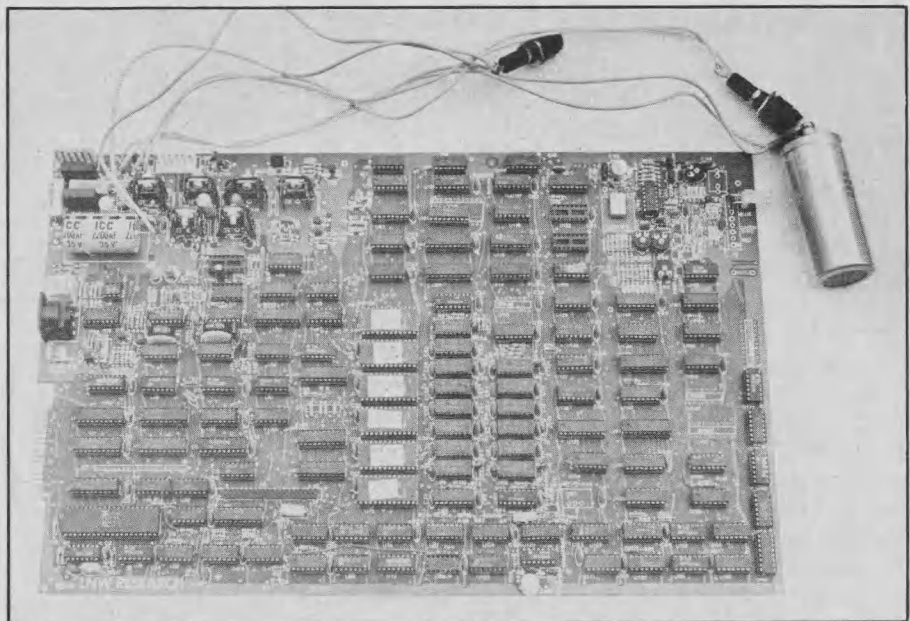
Completed and ready to go. An assembled version is also available from LNW (2620 Walnut, Tustin, CA 92680).

ponent type. Unfortunately, the two lists did not entirely agree with each other, which led to a little confusion during assembly. I again warn the inexperienced builder to avoid this project if he is not prepared for little pitfalls such as this.

Upon completion, the board had the usual complement of reversed ICs and so on. But upon correction it sprang to life at the first power-up with the familiar TRS-80 initialization sequence on the screen.

The LNW-80 performs superbly with all features as advertised. All software has loaded and run without a hitch. The high-density graphics and color features open up a whole realm of possible applications for both game playing and business and scientific applications.

With the LNW-80, the power of the TRS-80 is available to those who enjoy "rolling their own." The price and performance of the LNW-80 make it an excellent bargain. ■



LNW-80 board. Z-80A is on lower left, power supply upper left, Level II ROMs in center (with stickers), 16K RAM to the right of the ROMs, color video section on the upper right.

# Lighten Your Search

*Here's a useful, easy-to-use information storage and retrieval system for the Apple II.*

By Paul Hyman

Here's a program for the Apple II, written in Applesoft Basic, that can be used to store and retrieve records containing text data using a DOS random access disk file. It lets you specify data items to be kept in a database, add records to the database, update existing records, delete records and find records by searching for items containing specified character strings. Although it may not have all of the features of similar commercially available programs, it should prove sufficient for many personal and small-business applications.

## Program Operation

The program begins by asking if a new database is to be created or an old one used. Databases can be created at any time, as long as you give them names different from existing ones. The program will ask for the name of the database and then for the name and length of each field.

As an example, to create a file containing people's names and telephone numbers, fields called LAST NAME, FIRST NAME and TELEPHONE, with lengths of 30, 30 and 13 respectively, might be used. Note that the lengths can be anything up to 255, but they should be as small as possible, since making them bigger than necessary will waste space in the disk file. When all the desired fields have been entered, answer the FIELD NAME prompt with just a carriage return. The program will then create two disk files, one called DEFINITIONS/database name, and the other with just the name of the database. The definitions file contains information on the record size of the data file and the item names and lengths, while the other file will contain the actual data.

Once you've created a database, the

program will return to the first menu. Now, the response to access an existing database can be selected, and the name of the one which was just created given. Then the main menu will be displayed, offering several options. There will be no data in the file at this point, so the first thing to do is select the ADD RECORD option. The program will then prompt for each of the fields that were defined. After you've entered all of the fields, the record will be written to the file, and the program

will return to the main menu.

The other items on the menu are QUIT, SEARCH FOR RECORD and LIST ENTIRE DATA BASE. Once started, the list and search options work the same. Each record that exists (for the list option) or matches the search string (for the search option) is displayed on the screen, and the program waits for input with a prompt

*Address correspondence to Paul M. Hyman, 811 Azalea Ave., Placentia, CA 92670.*

*Program listing. Information storage and retrieval program for the Apple II.*

```
10 REM *****
20 REM *
30 REM * INFORMATION STORAGE AND *
40 REM * RETRIEVAL SYSTEM FOR THE *
50 REM * APPLE II. *
60 REM * P.M. HYMAN *
100 DIM A$(20)
200 DIM A$(20)
300 DIM B$(20)
400 FD = 0
500 B = 0
600 D$ = CHR$(4)
700 HOME
800 PRINT " INFORMATION STORAGE AND RETRIEVAL"
900 HTAB 15: PRINT "SYSTEM"
1000 VTAB 5
1100 PRINT "ENTER OPTION:"
1200 PRINT "1) CREATE NEW DATABASE"
1300 PRINT "2) ACCESS/UPDATE EXISTING DATABASE"
1400 INPUT OP
1500 ON OP GOTO 13200,1700
1600 GOTO 1100
1700 INPUT "DATABASE NAME - ";F$
1800 F$ = "DEFINITIONS/" + F$
1900 PRINT D$;"READ";F$
2000 INPUT N$
2100 INPUT I
2200 B = 10
2300 FOR J = 1 TO I
2400 INPUT A$(J - 1): INPUT A$(J - 1)
2500 B = B + A$(J - 1)
2600 NEXT
2700 PRINT
2800 PRINT D$;"CLOSE ";F$
2900 PRINT D$
3000 IF FD = 0 THEN GOSUB 31010
3100 HOME
3120 PRINT "ENTER OPTION:"
3200 PRINT "1) ADD RECORD"
3300 PRINT "2) SEARCH FOR RECORD"
3400 PRINT "3) LIST ENTIRE DATA BASE"
3500 PRINT "4) QUIT"
3600 INPUT OP
```

More →



line at the bottom of the screen. If a carriage return is entered in response to the prompt, the next record (if listing the entire database), or the next record meeting the search string (if searching) will be displayed. Entering an S will cause the program to stop the search and return to the main menu, a D will delete the record and a C will allow the record to be changed.

The program is easy to use, with prompts whenever input is required, and menus listing available options. Only one option is not listed in a prompt; when entering a string in the search-for-record option, if you enter an asterisk (\*) as the first character, any record containing that string in the specified data item will be considered a match. Otherwise, the specified data item must be identical to the specified string.

For example, when searching for a last name of Smith in the telephone number file described earlier, asking for \*SMITH would also show records containing SMITHY, SMITHERS, etc. In this case, use of the \* option would not be appropriate. However, if searching for all persons whose area code was 213, searching for \*(213) would do the trick.

The program keeps the records in the data file as a linked list, with each record that contains data having the record number of the next record (a forward pointer), and the record number of the previous record (a backward pointer). Although this makes the program a little more complicated than maintaining a simple sequential file, it lets you add and delete records without the time-consuming searches and data moves that would otherwise be necessary.

The first three records in the file contain no data, but are used for special purposes. The first record (record 0) contains the highest record number currently written to the file. This is used when a record is to be added but no deleted records are available for re-use, so that a record can be added to the end of the file without having to read the whole file to find where the end is. Record 1 contains the number of the first available record (one that has been deleted and is available for re-use), and record 2 contains the number of the first in-use record.

I won't go into the mechanics of adding and deleting records from a linked list here, since you don't need to know this to use the program and since explanations can be found in many books. ■

# Listing continued.

```

3700 X = FRE (0)
3800 IF OP = 4 THEN GOTO 13000
3900 LE = 0
4000 ON OP GOTO 16800,4300,4200
4100 GOTO 3100
4200 LE = 1: GOTO 5100
4300 PRINT : PRINT "SEARCH ON WHICH FIELD?"
4400 FOR J = 1 TO I
4500 PRINT J;") ";A$(J - 1)
4600 NEXT
4700 INPUT S
4800 IF S < 1 OR S > I THEN PRINT "NUMBER OUT OF RANGE": GOTO 4300
4900 SS$ = A$(S - 1)
5000 INPUT "SEARCH FOR? ";SF$
5100 RN = 2:BN = 0: GOSUB 30000
5200 INPUT K
5300 IF K = 0 GOTO 12700
5400 BO = 10
5500 HOME
5600 FOR J = 1 TO I
5700 PRINT
5800 PRINT D$,"READ ";N$;"R";K$;"B";BO
5900 INPUT B$(J - 1)
6000 B$(J - 1) = LEFT$(B$(J - 1),A$(J - 1))
6100 BO = BO + A$(J - 1)
6200 PRINT D$
6300 NEXT
6400 IF LE = 1 THEN 7600
6410 REM SEE IF STRING STARTS WITH A *
6500 IF LEFT$(SF$,1) < > "*" GOTO 7400
6510 REM YES, SEE IF STRING IS IN THE FIELD
6600 LN = LEN (SF$) - 1
6700 SN$ = RIGHT$(SF$,LN)
6800 LB = LEN (B$(S - 1))
6900 M = 1
7000 IF MID$(B$(S - 1),M,LN) = SN$ GOTO 7600
7100 M = M + 1
7200 IF M < LB GOTO 7000: REM LOOP TO TEST ALL BYTES
7300 GOTO 12400
7400 IF SF$ = B$(S - 1) THEN 7600
7500 GOTO 12400
7600 HOME
7700 FOR J = 1 TO I
7800 HTAB 1
7900 INVERSE : PRINT A$(J - 1);: NORMAL
8000 PRINT " - ";B$(J - 1): PRINT
8100 NEXT
8200 VTAB 23
8300 PRINT "ENTER C (CHANGE), D (DELETE)
8400 PRINT "S (STOP SEARCH) OR RETURN";
8500 GET Q$
8600 PRINT Q$
8700 HOME
8800 IF Q$ < > "C" THEN 10400
8900 PRINT : PRINT "CHANGE WHICH FIELD?"
9000 FOR J = 1 TO I
9100 PRINT J;") ";A$(J - 1)
9200 NEXT
9300 INPUT S
9400 PRINT "ENTER ";A$(S - 1);
9500 INPUT " ";B$(S - 1)
9600 BO = 10
9700 FOR J = 1 TO I
9800 RN = K:BN = BO: GOSUB 31000
9900 PRINT B$(J - 1)
10000 BO = BO + A$(J - 1)
10100 NEXT
10200 PRINT D$
10300 GOTO 5400
10400 IF Q$ = "S" THEN 2900
10500 IF Q$ < > "D" THEN 12400
10600 RN = K:BN = 0: GOSUB 30000
10700 INPUT FL: REM GET FWD LINK
10800 BN = 5: GOSUB 30000
10900 INPUT BL: REM GET BWD LINK
11000 IF BL = 0 THEN BL = 2: REM USE LIST HEADIF FIRST REC
11100 RN = BL:BN = 0: GOSUB 31000
11200 PRINT FL: REM COPY FL TO PREV
11300 IF FL = 0 GOTO 11600
11400 RN = FL:BN = 5: GOSUB 31000
11500 PRINT BL: REM COPY BL TO NEXT
11600 RN = 1:BN = 0: GOSUB 30000
11700 INPUT FL: REM AVAIL LIST PTR
11800 GOSUB 31000
11900 PRINT K: REM LINK IN REC
12000 RN = K:BN = 0: GOSUB 31000
12100 PRINT FL: REM PT TO NXT AVAIL
12200 PRINT D$: PRINT "DELETED"
12300 GOTO 2900
12400 RN = K:BN = 0: GOSUB 30000
12500 INPUT K: IF K = 0 GOTO 12700
12600 GOTO 5400
12700 HOME : HTAB 10: PRINT "END OF DATA"
12800 FOR M = 1 TO 1500: NEXT
12900 GOTO 2900

```

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Listing continued.

```

13000 IF FO = 1 THEN GOSUB 31020
13100 END
13110 REM ** CREATE NEW DATABASE**
13200 HOME
13300 B = 10: REM BYTE COUNT STARTS AT 10 (2 LINK FIELDS)
13400 INPUT "DATABASE NAME -- ";C$
13500 F$ = "DEFINITIONS/" + C$
13600 FOR I = 1 TO 20 STEP 1
13700 INPUT "FIELD NAME -- ";A$(I)
13800 IF A$(I) = "" GOTO 14400
13900 INPUT "NUMBER OF CHARACTERS -- ";AZ(I)
14000 IF AZ(I) < = 0 GOTO 13900
14100 B = B + AZ(I)
14200 IL = I
14300 NEXT I
14400 PRINT D$;"OPEN";F$
14500 PRINT D$;"WRITE";F$
14600 PRINT C$
14700 PRINT IL
14800 FOR J = 1 TO IL
14900 PRINT A$(J): PRINT AZ(J)
15000 NEXT
15100 PRINT D$;"CLOSE";F$
15200 HOME
15300 PRINT " FIELD DEFINITIONS SAVED"
15400 PRINT "NUMBER OF FIELDS= ";IL
15500 N$ = C$
15600 PRINT D$;"OPEN ";N$;"L";B
15700 RN = 0:BN = 0: GOSUB 31000
15800 PRINT 2: REM WRITE HBW
15900 RN = 1: GOSUB 31000
16000 PRINT 0: REM WRITE AVAIL LIST HEAD
16100 RN = 2: GOSUB 31000
16200 PRINT 0: REM WRITE DATA LIST HEAD
16300 BN = 5: GOSUB 31000
16400 PRINT 0
16500 PRINT D$
16600 GOTO 1100
16700 REM FIND AVAILABLE REC
16800 RN = 1:BN = 0: GOSUB 30000
16900 INPUT AV
17000 IF AV = 0 THEN 18300
17100 PRINT D$
17200 RN = AV
17300 GOSUB 19900
17400 RN = 2:BN = 0: GOSUB 30000: INPUT FP
17500 GOSUB 31000: PRINT AV
17600 RN = AV: GOSUB 30000: INPUT FL
17700 RN = 1: GOSUB 31000: PRINT FL
17800 RN = AV: GOSUB 31000: PRINT FP
17900 BN = 5: GOSUB 31000: PRINT 0
18000 IF FP = 0 GOTO 2900
18100 RN = FP:BN = 5: GOSUB 31000: PRINT AV
18200 GOTO 2900
18300 RN = 0: GOSUB 30000
18400 INPUT HB
18500 HB = HB + 1:RN = HB
18600 PRINT D$
18700 GOSUB 19900
18800 RN = 2:BN = 0: GOSUB 30000: INPUT FP
18900 GOSUB 31000: PRINT HB
19000 RN = HB: GOSUB 31000: PRINT FP
19100 BN = 5: GOSUB 31000: PRINT 0
19200 IF FP = 0 GOTO 19400
19300 RN = FP:BN = 5: GOSUB 31000: PRINT HB
19400 RN = 0:BN = 0: GOSUB 31000
19500 PRINT HB
19600 PRINT D$
19700 GOSUB 31020
19800 GOTO 2900
19900 BO = 10
20000 HOME
20100 FOR J = 1 TO I
20200 HTAB 1
20300 PRINT "ENTER ";A$(J - 1);" -- "
20400 INPUT B$(J - 1)
20500 BN = BO
20600 GOSUB 31000
20700 PRINT B$(J - 1)
20800 BO = BO + A$(J - 1)
20900 PRINT D$
21000 NEXT
21100 RETURN
29900 REM SUBROUTINES TO READ AND WRITE A GIVEN
29910 REM RECORD NO. (RN) AT A FIELD STARTING AT BYTE BN
30000 PRINT D$;"READ ";N$;"R";RN;"B";BN: RETURN
31000 PRINT D$;"WRITE ";N$;"R";RN;"B";BN: RETURN
31005 REM OPEN AND CLOSE ROUTINES
31010 PRINT D$;"OPEN ";N$;"L";B:FO = 1: RETURN
31020 PRINT D$;"CLOSE ";N$;FO = 0: RETURN

```



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# Submit to CP/M

*Learn to chain files together using CP/M's equivalent to Job Control Language—the Submit file.*

By Wesley E. Barbour

With so many useful programs and utilities becoming available to run under the CP/M operating system, it is tempting to use several of these together for various applications. Wouldn't it be great to be able to "chain" from one program to another, even if the programs are written in different languages?

For example, a CBasic program might be written to print mailing labels and also let you choose one of several sorted orders or tell the program you are ready to print. After you choose a sorted order (by entering the choice number), the CBasic program ends, and another program such as MicroPro's Supersort takes over to perform the particular detailed sort you requested. When the sort is completed, your CBasic program is again loaded and printing can begin.

One way of doing this is to make the CBasic program create its own ready-to-run Submit file. A built-in feature of CP/M is that whenever a warm boot is performed (such as reaching a stop statement in CBasic or after executing a system statement in Microsoft Basic), the program searches for a file on drive A called \$\$\$\$.SUB.

This file is normally created by the CP/M Submit utility that came with your CP/M. Whenever it exists, CP/M takes the commands from this file instead of the keyboard. Unfortunately, information is stored in this

file in an unconventional way, and most descriptions of the Submit features tell us that the only way to create such a file is through the Submit utility.

The \$\$\$\$.SUB file contains one or more 128-byte records. The first byte in each record is the length (number of characters) of the CP/M command that follows. Then the command is stored simply as a series of ASCII characters. It doesn't matter what follows the command; the Submit utility leaves garbage in the record after the command.

There is only one command per 128-byte record. The commands are stored in reverse order (that is, the last record in the file is executed first), and when a record is executed it is effectively erased. When the complete file has been executed, it is automatically erased.

## The Programs

One of the two program segments included with this article is a "user-defined function" (a special kind of subroutine) written in CBasic; the other is a regular subroutine written in Microsoft Basic (see Listing 1). Each routine, when placed in your program, allows your program to create and use the special \$\$\$\$.SUB file.

To use these routines, you must supply three parameters: the command you want to store in the file, the sequence number that determines in which order your com-

mands will be executed, and the logical file number used to reference the file while it is open (use a number that is not currently active).

One of the advantages of a user-defined function over a simple subroutine is that the names of the variables do not have to either match or be different from variables in the main program. This allows the same function to be used without change in many different programs, and all you have to do is transfer a copy of it from a text file on disk where it is kept to the appropriate place in any given program written in the same language. The user-defined function gets the values it needs (parameters) from the relative position of the variables or values in parentheses when the function is requested (called) by the main program.

Let's set up the statement which calls the function using the example above. Let's assume our CBasic program is called Mailist. Since we eventually want to return to the Mailist program, that command should be stored first in the \$\$\$\$.SUB file (remember, the commands are executed in reverse order):

```
X% = FNCHAIN%('A:CRUN2 A:MAILIST',  
1,20)
```

---

*Address correspondence to Wesley E. Barbour, RR 1, Box 208, Agamenticus Road, Cape Neddick, ME 03902.*

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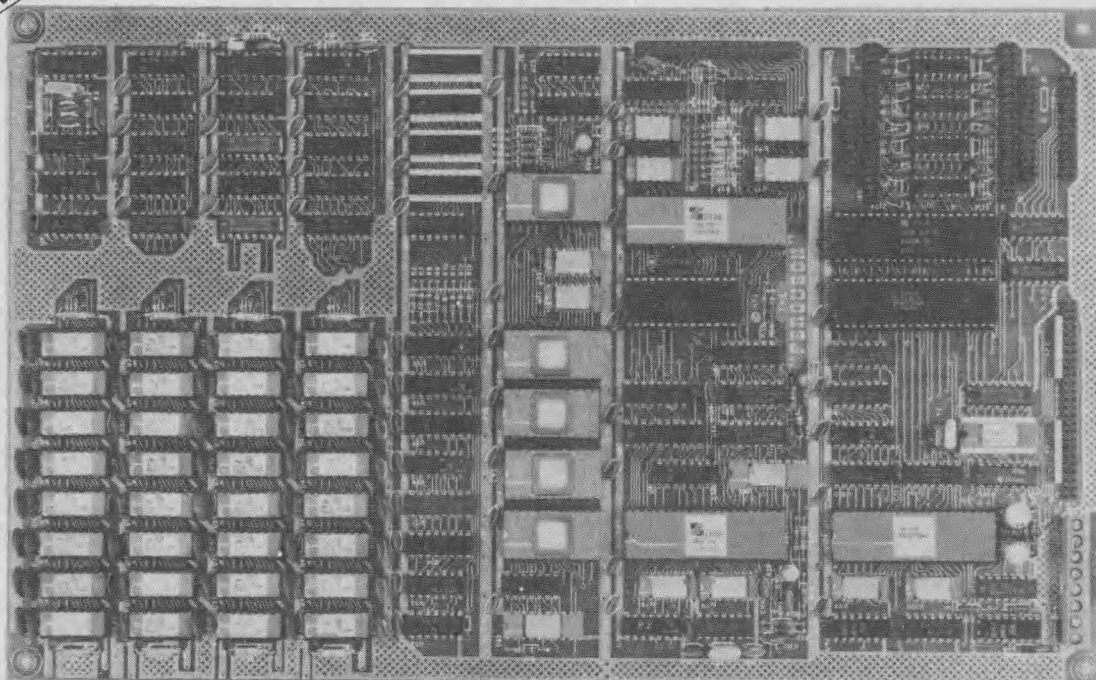
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The 1 causes this command to be placed in the first 128-byte record in the file; 20 is an otherwise unused file number.

The variable X% will have a value of 0 if the function is able to write in the file, or a value of 1 if there is a nonfatal error. It is a good idea to specify the drive along with the actual file name so that the program will operate correctly no matter which drive is the currently logged-in drive.

Now we need to call the function again, this time to place Supersort into operation. The command line will also have to pass the sort requirements to the sort program (unless we set up a special command file):

```
X%=FNCHAIN%("A:;SORT; IN=100,CR;
SORT B:MAIL.DAT; OUT=B:SORTED.DAT;
KEY=#7,5,#1,20; GO",2,20)
```

This statement would be typed on one line. It loads and executes a program on the A drive called Sort. Records to be sorted have a maximum length of 100 characters and are delimited by carriage returns. The file you want to sort is called MAIL.DAT on drive B. The sorted results are to be put in a file called SORTED.DAT also on drive B. The records are sorted by field number 7 (zip code) and within a given zip code by field number 1 (last name). "GO" directs the sort to begin without further action. The 2 indicates this long command will be stored in the second record of \$\$\$SUB.

Since there will only be two records in this example, the sort command will execute first, then the CBasic program Mailist will execute again. (The second time, of course, the sorted order will already be determined, and you could choose a print option from the menu.)

Once have you stored the necessary commands in the \$\$\$SUB file, the CBasic program must execute a stop. This will return control to CP/M and the newly created Submit file will take over.

The special function will look for a \$\$\$SUB file, and if not found, will create one. CP/M will automatically erase it after all commands have been executed.

In order to use the MBasic version, your program must supply the values for COM\$ (the command to be executed), S% (the sequence number) and F% (the logical file number). Then use a GOSUB 50 statement (or whatever line number you gave the subroutine) whenever you want to

stuff a command into the \$\$\$SUB file. A System command is needed to leave MBasic, at which time the \$\$\$SUB file will begin execution.

The same types of routines can be placed in most programs used with CP/M no matter which languages

they are written in—Pascal, Cobol, Fortran or assembly. However, Basic from Micro Mikes will not work due to the inability of that language (similar to North Star Basic) to specify an alphanumeric file type such as .SUB. ■

```
*****
CBASIC FUNCTION:

DEF FNCHAIN%(COM$,SEQUENCE%,FILE%)

REM Will set up or add to temporary file which will operate
REM as a "submit" file automatically at the next warm boot,
REM effectively allowing program chaining outside CBASIC

IF END # FILE% THEN 17.71
OPEN "A:$$$SUB" RECL 128 AS FILE%
GOTO 17.72
17.71 CREATE "A:$$$SUB" RECL 128 AS FILE%
17.72 IF END # FILE% THEN 17.73
PRINT USING "%"; # FILE%, SEQUENCE%; CHR$(LEN(COM$))+COM$
CLOSE FILE%
FNCHAIN%=0
RETURN
17.73 FNCHAIN%=1
CLOSE FILE%
RETURN
FEND

*****
MBASIC SUBROUTINE:

50 OPEN "R", #F%, "A:$$$SUB", 128:FIELD#F%, 128 AS BUF$:
LSET BUF$=CHR$(LEN(COM$))+COM$:PUT #F%, S%:CLOSE #F%:RETURN

*****
SAMPLE CBASIC TEST PROGRAM:

REM **** CBASUB ****
REM CBASIC PROGRAM TO DEMONSTRATE USING A SUBMIT FILE TO CHAIN\
SOMEWHERE OUTSIDE CBASIC

DEF FNCHAIN%(COM$,SEQUENCE%,FILE%)
IF END # FILE% THEN 17.71
OPEN "A:$$$SUB" RECL 128 AS FILE%
GOTO 17.72
17.71 CREATE "A:$$$SUB" RECL 128 AS FILE%
17.72 IF END # FILE% THEN 17.73
PRINT USING "%"; # FILE%, SEQUENCE%; CHR$(LEN(COM$))+COM$
CLOSE FILE%
FNCHAIN%=0
RETURN
17.73 FNCHAIN%=1
CLOSE FILE%
RETURN
FEND

COM$="CRUN2 CBASUB"
X%=FNCHAIN%(COM$,1,1)
INPUT "CP/M command desired? ",COM$
X%=FNCHAIN%(COM$,2,1)
REM FILE IS NOW READY AND SHOULD EXECUTE\
WHEN THIS PROGRAM TERMINATES
END

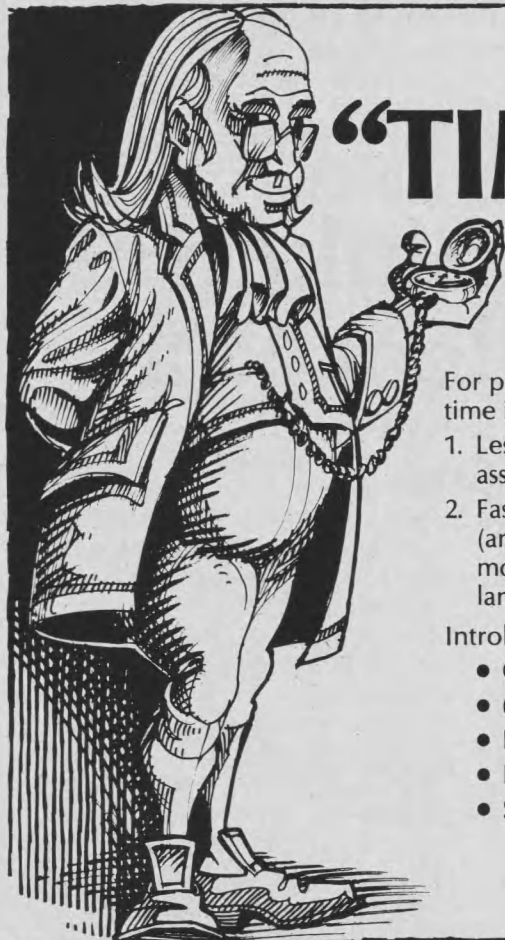
*****
SAMPLE MBASIC TEST PROGRAM:

10 REM **** MCHAIN.BAS ****
20 GOTO 100
50 OPEN "R", #F%, "A:$$$SUB", 128:FIELD#F%, 128 AS BUF$:
LSET BUF$=CHR$(LEN(COM$))+COM$:PUT #F%, S%:CLOSE #F%:RETURN
100 F%=1:S%=1:COM$="MBASIC B:MCHAIN":GOSUB 50
110 INPUT "CP/M command desired";C$
120 S%=2:COM$=C$:GOSUB 50
130 SYSTEM

*****
NOTE: Since both of the test programs are endless loops, we need
to terminate their operation by using the control-C or "DEL" keys
during the execution of the $$$SUB file, which will cancel
operation of the submit file and cause it to be erased.
```

Listing 1. Routines that let you "chain" CP/M programs.





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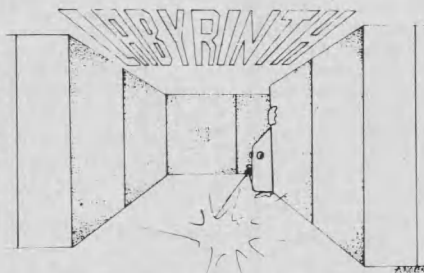
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OSI

# Bubble Sort with Sinkers: A Still More Excellent Way

*The most efficient way yet to sort record lists.*

By David Vergin

The two-direction bubble sort described in the April 1981 issue of *Microcomputing* ("A Better Bubble Sort" by W. A. Harrison and S. H. Sachs, p. 148) points the way to a bubble-sort algorithm that is as simple as the one-direction sort but faster than the full-pass two-direction sort. The sort described here usually makes about half as many comparisons of item pairs as the standard bubble sort.

Sample sorts show that all three of these pair-switching sorts do the job using the same number of switches. No improvement in the number of

switches is possible within the limits of the pair-switching technique. But the improvement shown by the two-direction sort shows that you can appreciably reduce the number of comparisons that must be made. The sorting algorithm presented here is one possible pattern for minimizing the number of comparisons.

The problem with full-pass bubble sorts is that, for the sake of a simple algorithm, many properly-oriented pairs are examined again and again. To eliminate this, you need a way to recognize patterns in the emerging order that need not be re-examined as

the sort continues.

## Sinkers

The "bubbles" in a bubble sort are, of course, high numbers (or alpha strings) that are too near to the bottom of the list. These must float up to the top of the list during the sort. These bubbles displace smaller numbers (sinkers) near the top of the list and push them down to their proper positions. In the two-direction sort (Fig. 1), the sinkers drop more quickly during the downward pass as opposed to a one-direction sort, in which they are displaced one posi-

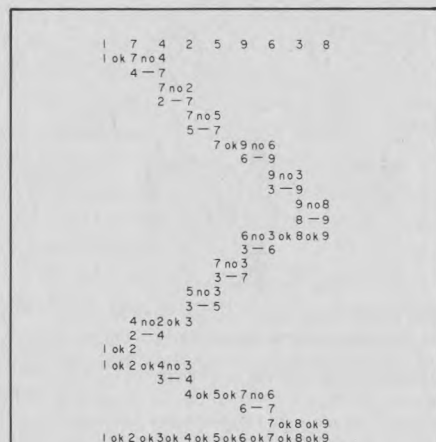


Fig. 1. A full-pass two-direction sort routine requires the indicated 32 comparisons and 12 switches to order the digits from the initial arrangement.

Address correspondence to David Vergin, PO Box 700, Milton, WA 98354.

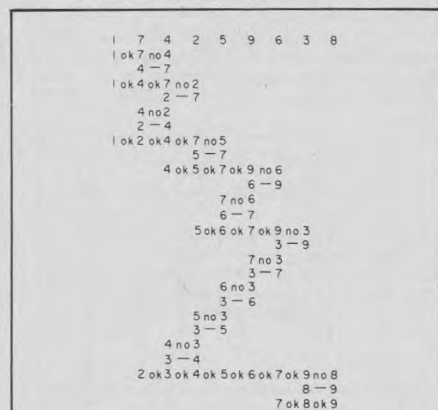


Fig. 2. A sinker-following-bubble routine requires 33 comparisons and 12 switches to do the same job shown in Fig. 1.

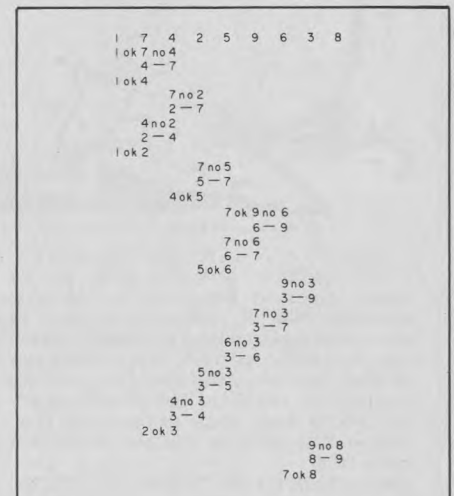


Fig. 3. A pop-up bubble sort with sinkers requires only 20 comparisons and 12 switches to arrange the digits in proper order.



tion at a time with each upward pass.

Let us first modify the full-pass two-direction sort slightly (see Fig. 2). We begin on an upward pass. Suppose that when we make a switch we interrupt our upward progress to immediately check the switched sinker against the next lowest item to see if it should drop more than a single position. If the second comparison shows that the sinker should not fall further, we simply continue on the upward pass. But if the second comparison shows that the sinker should continue falling, we make the switch and check the new *next lowest* item.

We continue working our way back down the list until the sinker bumps into a smaller item below it and comes to rest in proper (though partial) order. At this point we again reverse direction and continue working our way up the list until another switch is needed; we follow that new sinker down as far as necessary.

In this way we progress by a series of partial passes tending upward whenever a sinker does not carry us down. When we finally reach the top, the list is sorted and we're done. This modified strategy usually eliminates a few comparisons over the

full-pass two-direction sort. But its real importance is that it exposes a pattern. As can be seen in the sinker-following-bubble sort in Fig. 2, the downward passage of a sinker through previously-sorted items does not disturb their proper order. The sinker must be compared at each new level to see if it should drop further. But once it reaches its resting place, the return pass up over the previously sorted material (to the previous high point of the search) is superfluous. Much better to pop up and continue the upward pass at the point where the sinker was first discovered. Everything below that is now in order.

The progress of such a pop-up bubble sort with sinkers is shown in Fig. 3. The bonus is program simplicity. As the flowchart in Fig. 4 shows, this modified bubble sort is just as simple as the standard one-direction sort. Because we know that everything below us is always in proper order at any point, we no longer have to keep track of the execution of switches during a pass to know when we are done.

Also, because the backing-down routine is part of the switching

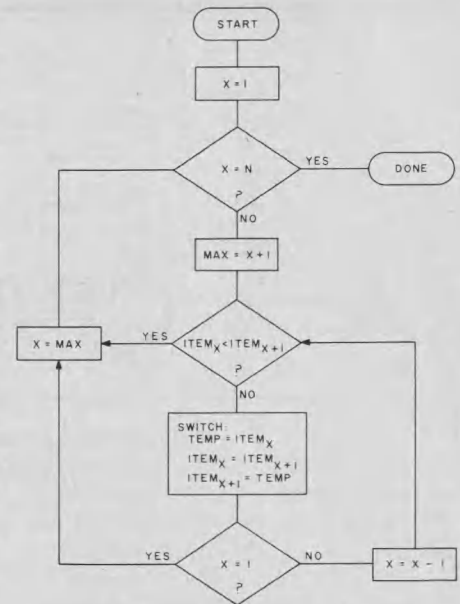


Fig. 4. Flowchart for the pop-up bubble sort with sinkers routine.

branch of the program, we eliminate almost half of the full-pass two-direction flowchart. The other basic change is a variable, MAX, to keep track of the top of the sorted material so we can pop up to a new bubble after following a sinker down. ■

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# CP/M Table-Setter

*Its word processing capability gives this table maker more flexibility than other spreadsheet programs.*

By Frank Derfler

If you've been watching the ads for CP/M-compatible software, you've probably seen Lifeboat Associates' ad for a program called T/Maker II. The name T/Maker stands for table maker. This is the second version of the table-maker software, and it's marketing's good fortune that the name alliterates.

T/Maker II displays information in the form of tables. It shares this characteristic with such popular programs as VisiCalc and SuperCalc. But T/Maker II can be used in applications that the other spreadsheet programs could never touch.

T/Maker II can display and sort numbers, letters or combinations of numbers and letters. A typical application might be to display informa-

tion on hourly workers in a business. The table of information could include the workers' names, the names of their supervisors, their hourly wages, total hours worked, overtime hours worked and their withholding costs. The information could be contained in a master data file with a great deal of other data. It can be sorted alphabetically by name, grouped by supervisors, or displayed according to salary, withholding or any other factor.

The financial information can be entered or changed in any column and all columns recalculated with a simple command. Tables created by T/Maker II can be embedded in text and easily printed out as part of a report or even transmitted over elec-

tronic mail systems.

Two features of T/Maker II make it easy to use. The first is a complete word processing program on the order of the famous Electric Pencil. The second is a complete command language that enables beginning users to immediately use the power of the software and provides experienced users with a very fast information manipulation tool.

## The T/Maker II Word Processor

The T/Maker II Edit function is a separate overlay program which provides a fully capable character-oriented word processor. Every common editing function (character insert/delete, global search/replace, full cursor control, and so on) is available through easily used control codes. Some uncommon capabilities are available too. The Edit program lets the user store a few lines (the space available for storage depends on the RAM available) that will be used repeatedly throughout the text. These characters are then entered into the text with a control-X command. This feature is certainly handy for preparing reports in which lengthy corporate, academic or other titles must often appear.

Sales Data				
	1977	1978	Increase	Total
ex	9999.99	99999.99	99999.99	99999.99
ac1	-	+	=	
ac2	+	+		=
+ Item A	9	11.1		
+ Item B	11.23	14.11		
= Total				

Table 1. The T/Maker II command syntax is easily understood. The line starting with ex (which stands for example) tells T/Maker where you want the numbers placed and what they should look like. Those 9's are simply place holders. The instruction ac means always compute. The numbers 1 and 2 in ac1 and ac2 are equation numbers which can range from 0 to 20. In this example, ac1 is a column equation and ac2 is both a column and a row equation. The instructions for ac1 simply say, "Subtract row 1 from row 2 and display the difference in row 3." Similarly, ac2 is a straight addition instruction. Other instructions let the user set conditions and variables.

Address correspondence to Frank J. Derfler, Jr., PO Box 691, Herndon, VA 22070.



Additionally, other lines can be sent out to temporary storage in a buffer and called back in when needed. This is great for those of us whose thoughts get ahead of our logic. It's nice to be able to save a good thought for later use in a more appropriate place.

The T/Maker II editor will scroll the screen so that documents wider than the available display screen can be created. Again, this capability is handy for writing reports and statistical spreadsheets. A unique Frame mode lets you move around inside a big document and not get lost. When you select Frame mode, a representational map of the document is created which shows you where you are; you can continue to edit and create data in the Frame mode. This is very useful for making little changes to already-existing large documents.

The editor has a printing function which can provide justification and column printing. Subroutines to do proportional spacing are not included, but that function can be provided by system-unique software or even by the printer itself. Other features are provided, such as page pause to change paper and the proper handling of tabs for table printing.

The T/Maker II editor is very powerful, and its integration into T/Maker II adds a great deal of value to the complete package.

## Table Making

As nice and as powerful as the T/Maker II word processor is, it would be just another word processor without the table creation and manipulation functions. The Compute subroutine is the heart of the table creation function. It is used to call data from the files and to perform the data manipulations. The first step in creating a simple table is to type in the headings and numbers. This is essentially a typing task, and full editing capabilities are available. The second phase involves entering the formatting instructions and the equations that tell the program what to do with the data.

I found a great similarity between the process of learning T/Maker II's command language and the process of learning Basic. Both languages can be used by beginners with very little instruction, both are powerful, and both let users achieve high levels of sophistication with experience. Basic and T/Maker II's command language use common symbols and meaning-

		Sales Data			
		1977	1978	Increase	Total
ex		9999.99	99999.99	99999.99	99999.99
ac1		-	+	=	
ac2		+			=
+	Item A	9.00	11.10	2.10	20.10
+	Item B	11.23	14.11	2.88	25.34
=	Total	20.23	25.21	4.98	45.44

*Table 2. The Compute command directs the program to work the equations and display the results according to the instructions in the table. After the table has been calculated, you can still change any number or equation and have the calculations done again.*

ful phrases to create commands. In both languages, there are often several ways to do the same job. I don't mean to imply that T/Maker II's commands are the same as Basic, only that the level of effort and the nature of the learning experience are similar.

Table 1 explains one fairly simple T/Maker II table. This table is an example of one constructed for limited use. The data is entered directly into the table, the commands are given and the results computed. The data and formulas may be changed and recomputed (and the results of each change saved separately), but this kind of table would mainly be used for limited runs on limited amounts of data.

Obviously, this kind of analysis becomes very powerful when it can be applied to large bodies of data repeatedly over long periods of time. This analytical capability is needed for business reports, academic studies and many other statistical problems. T/Maker II lets users selectively and automatically pluck data from extensive files and display and manipulate it in any assortment of permanent user-constructed files.

The greatest limitation in using desktop computers in business involves creating data files. Computers can file, sort and manipulate data, but somebody has to put the data into the system the first time. T/Maker II limits the weight of this burden because the data only has to be entered once. After that initial entry, the program can be instructed to pick through the data files to withdraw whatever information it needs for a particular application.

As a small bonus, the T/Maker II files are standard CP/M files. If you have to enter the data for other accounting or information programs to work on, it may be possible to structure the data files so they can be used

by programs other than T/Maker II. The files can also be easily transmitted by any of the popular smart terminal programs that run under CP/M.

The first step in using this function of T/Maker II is creating the data file. A typical data file groups the name of the information with a list of values. Because no difficult entry or typing is needed, file entry can be done by relatively inexperienced office personnel.

The harder job is the creation of the table mask, which is used to withdraw data and display it. This only has to be done once. After the file mask is created, running T/Maker II and creating tables is easy. Creating the mask isn't difficult, but some care and thought must be given to leaving space enough for the largest possible numbers that will be displayed and to calling out the data you really mean to use. "Garbage in—garbage out" still applies.

Once the mask is created and the equations are entered into the table, a simple Load command (specifying a file name) brings the desired data into the columns and rows. A Compute command causes the program to work the equations and display the results. A very handy Unload command takes the data out of the mask and stores it as a data table. In this way, yearly tables can work on the processed file data of a complete set of monthly tables. The system can rapidly generate a great deal of information—all from a one-time entry of the initial data.

## Operation

T/Maker II is easy for anyone to use. Mistakes in entering commands are met with understandable error messages. Mistakes in constructing the tables are easy to spot because of blank spaces, strange

amounts and other clues. It's good practice to run new tables with easy numbers that will produce predictable solutions. Nothing is more likely to cause the entire computerized system to fall from grace than reports that give the authority of computer processing to erroneous data.

In practice, you generate reports by first using T/Maker II tables to manipulate the data and determine the results. Save these final tables with one command—Compute Clean Save—which removes the equations and all directions and saves a clean table of data. Use the word processor to write text describing the data (or whatever needs to be discussed) and then call the tables into the text when appropriate. The entire document could then be printed out, transmitted using a communications program or transferred in disk format.

T/Maker II's documentation is excellent. The large manual has three sections: operation, installation and tutorial. The operation section includes an extensive table of contents but no index and is clearly written. The author doesn't use a lot of computer jargon, but rather helps the user understand T/Maker II commands and functions and apply the program to practical situations. The tutorial is excellent. It takes the user through a step-by-step on-line experience and describes what is happening along the way.

The disk includes a demonstration mode which automatically shows what the displays look like and how they can be used. It immediately

Sales Data				
	1977	1978	Increase	Total
Item A	9.00	11.10	2.10	20.10
Item B	11.23	14.11	2.88	25.34
Total	20.23	25.21	4.98	45.44

Table 3. When the table is ready to be printed, the equations, instructions, placeholders and all other excess information are removed with a simple Clean command.

removes the fear of the system that a new user is likely to have. The demonstration is also great for introducing the program to nontechnical people who will not be creating the table formulas and commands, but who will enter data and run the programs to generate the finished tables and reports.

### Installation

It is true that CP/M has become a widely accepted operating system allowing programs to be carried from one system to another. However, the need for program customization or installation still remains. This is particularly true of programs that make heavy use of the I/O ports and editing features available within the system. T/Maker II comes as a generalized program which must be tailored for operation on a specific system. Happily for those of us who are not expert machine-language programmers, a comprehensive installation and modification program is included on the program disk. The proper settings for the common CP/M microcomputer systems are included in the program.

Most versions of CP/M on the mar-

ket today make the computer react like a common terminal (usually the ADM3A) in the areas of cursor control, character deletion, reverse video, and so on. If you're running a reasonably standard configuration for your display and printer I/O, you can have T/Maker II up and running in just a few minutes by following the simple instructions. If you have a customized system, you will need to know such things as the address of the output data port and status port, polarity, and printer and cursor addressing techniques. If you have a system so different that it is not included in the T/Maker II menu, then you probably know these things by now anyway.

The T/Modify installation program lets you customize the word processor so it responds to the same commands as other programs you use. If you're accustomed to the control codes used in WordStar, Scripsit or Electric Pencil, you can make the T/Maker II editor respond to almost all of those same editing commands. This little feature may not seem significant, but it makes transition into the system much easier for anyone already familiar with a different word processing program. This is particularly important for nontechnical personnel who use another program regularly.

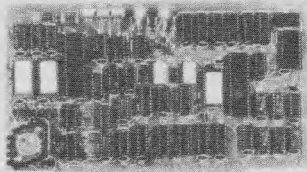
T/Maker II requires a 48K CP/M-equipped system to operate effectively. More memory will be useful for many applications. An 80-column display is ideal, but a version for 64-column screens is available.

### Value

T/Maker II has some excellent uses in business, the academic world and even personal finance. The combination of a word processor and table maker makes it a complete package—you really don't need anything else to generate first-class reports. It's a mature program with no bugs or quirks. The \$275 price makes it a great value for anyone who can use its capabilities. ■

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# In Step with the Heath H8

*Build this circuit to troubleshoot and single-step the HZ8 adapter and keep your H8 humming along.*

By J. Glenn Brookshear

Heathkit's H8 microcomputer is an outstanding choice for the computer enthusiast wanting to learn how a machine really works. Its excellent documentation and modular construction let you build an inexpensive starting system with a variety of ready-to-use software and then expand with professional or homebrew designs. (See, for example, the HZ8 adapter proposed by Patrick Swayne in his October 1980 article

"Upgrading the Heath H8 with a Z-80," p. 50). But if it fails to work when first turned on, a helpless feeling can quickly overcome one's enthusiasm.

One problem is that the H8's single-step feature is implemented by software; if the adapter is not executing correctly, there is no easy method of finding out what it is doing. To solve this problem I designed a hardware single-step circuit that fits on the HZ8 adapter. With this circuit and a logic probe, you can quickly trace the execution of the processor.

The single-step circuit is shown in Fig. 1 and a parts list is given in Table 1. The idea is to use the  $\overline{M1}$  pulse, which is generated during each op code fetch, to initiate a  $\overline{WAIT}$  that will last until the operator indicates otherwise. Thus, the processor will be stopped during each fetch, with the op code on the data lines and the corresponding address on the address lines.

Referring to Figure 1, note that if the processor is running, the next  $\overline{M1}$  signal will pull the  $\overline{CLEAR}$  pin of the 74LS74 low, causing the  $Q$  output to go low (and  $\overline{Q}$  to go high). Thus, the Z-80 will enter a wait state. During this wait state  $\overline{M1}$  is held low, but the RC network coupling it to the 74LS74 allows the  $\overline{CLEAR}$  pin to return to its

normally high value. If S1 is now switched to the left, a positive going edge is applied to the  $CLOCK$  pin of the 74LS74 which causes the high at D to be passed to the  $Q$  output. This in turn allows the processor to exit the wait state.

Switching S2 to the continuous-run position restores normal operation of the processor. Since this switch is not debounced, switching it from continuous-run to single-step will often catch the processor in a stage other than an op code fetch. This procedure can be used as an ad hoc method of obtaining additional information about what the Z-80 is doing.

The single-step circuit requires only one additional IC (the 74LS02), since one section of the 74LS74 used in the HZ8's optional section is available. I found ample room for the additional 74LS02 in the same area on the perfboard used for the optional section. I used a lever switch for S1, which I glued to the perfboard above the 8224. This allows for easy access when the adapter is installed.

For S2 I used a slide switch mounted between the 8080 socket and the 7405. Power and ground connections were obtained from the nearest source. In particular I took the 5 V for S1 from the 8224 and got power and ground for the additional

Quantity	Description
1	74LS02 IC
1	14 pin wire-wrap socket
1	SPDT slide switch
1	SPDT lever switch
3	330 ohm resistors (1/4 watt)
1	1k ohm resistor (1/4 watt)
1	680 pF capacitor

If the optional section of the HZ8 is not being built, a 74LS74 and a 14 pin wire-wrap socket are also needed.

Table 1. Parts list.

Address correspondence to J. Glenn Brookshear, Department of Mathematics and Computer Science, Marquette University, Milwaukee, WI 53233.



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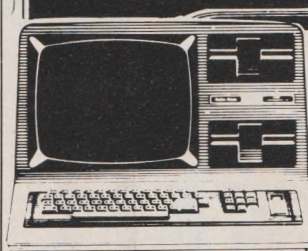
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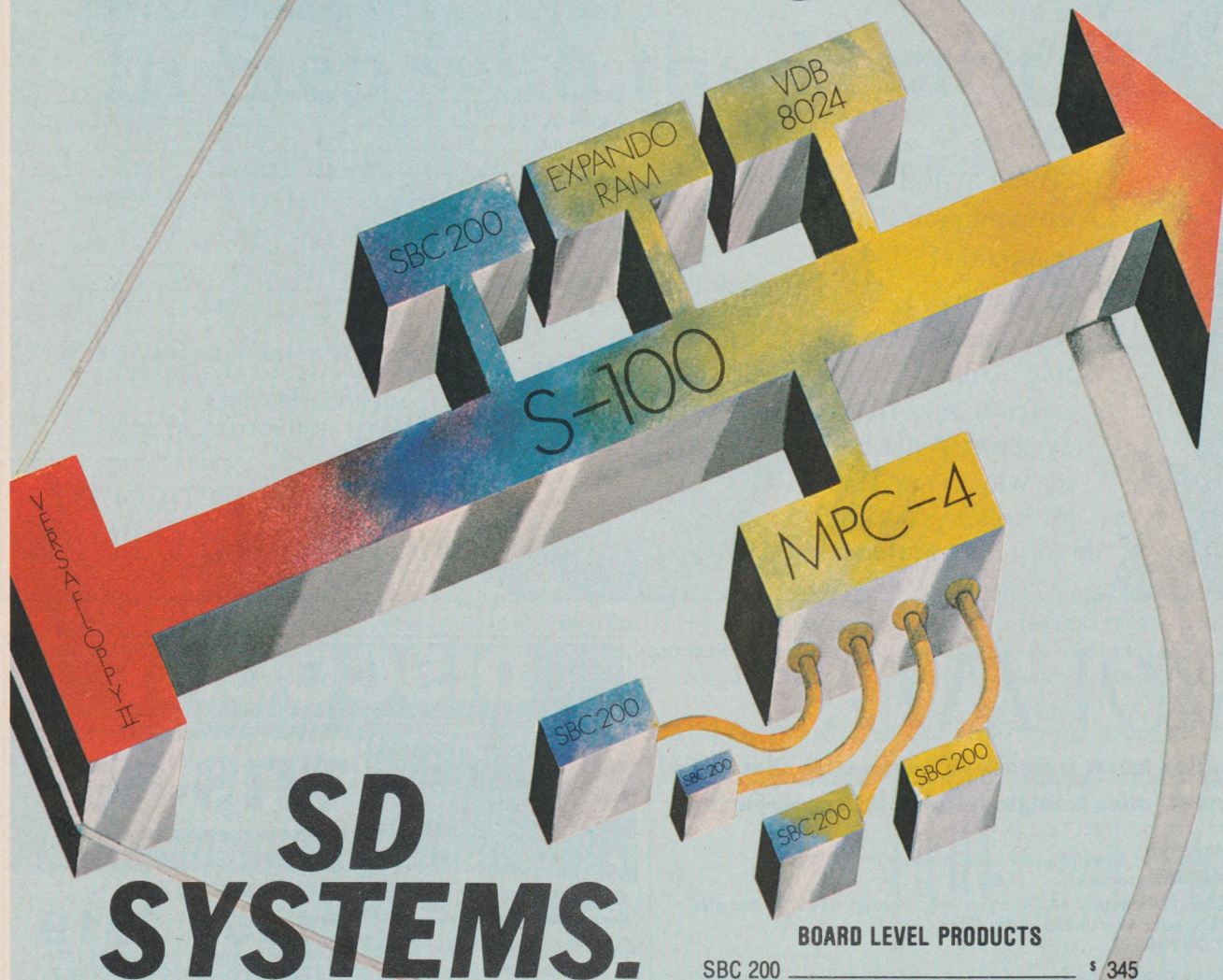
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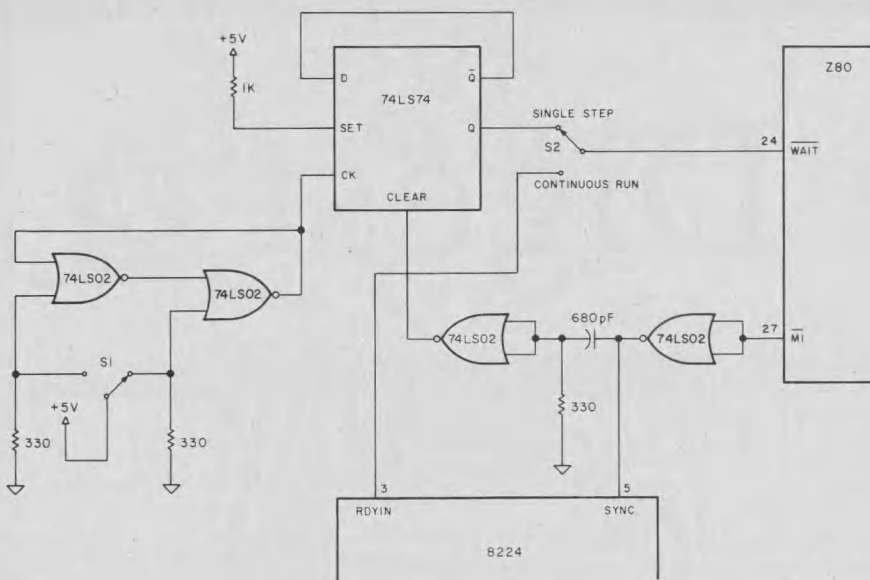


Fig. 1. Single-step circuit.

74LS02 from the Z-80.

### Troubleshooting

With the aid of the single-step circuit, you can troubleshoot the HZ8 as follows. Place S2 in its continuous-run position, install the adapter and try it. If PAM-8 runs you are in good shape. Otherwise, try the following:

Check to see that the run light on the front panel is on. If it is not, clock pulses are not getting out to the system. To make sure the clock itself is working, test pin 6 of the 8224 with a probe. It should glow with a brilliance between on and off which indicates the presence of pulses. Next, make sure the clock pulses are getting to the Z-80 by testing its pin 6 in the same way you tested pin 6 of the 8224. If any of these tests fail, your problem is probably incorrect wiring or poor connections associated with the 8224. You might want to make sure the 8224 is still all right by temporarily restoring the H8 to its original 8080 configuration.

Next, check pin 27 of the Z-80. Again, the probe should glow with a brilliance between on and off. If it doesn't, check the power and ground connections to the Z-80. (Also check pins 17 and 24 of the Z-80. They should be high.)

If everything is fine to this point, the Z-80 is probably running. Switch S2 to single step and turn the H8's power off and back on. With the probe check the address and data lines on the Z-80. The address should be zero and the data should be 00010001 (the first PAM-8 op code).

If this test fails, check the wiring on

all data and address lines. Also make sure pin 24 ( $\overline{\text{MEMR}}$ ) of the 8238 socket is low. Otherwise there is a problem in the circuit between this pin and the Z-80. The  $\overline{\text{MEMR}}$  signal should also be reaching pin 28 of the system bus as a high. (The generation of  $\overline{\text{MEMW}}$  can be checked in a similar way, but first the processor must be stopped during a write. This can be done by switching S2 from continuous-run to single-step until pin 22 of the Z-80 shows low when in single step. This method takes advantage of the bouncing of S2 as mentioned earlier.)

If these tests are successful, return S2 to the single-step position and turn the H8's power off and back on. Now, using S1, you can step through the PAM-8 routine, checking each address and op code as you go. This technique will tell you which of the address or data lines are not being honest or, as in my case, can lead to the discovery of more subtle problems as described below.

One of the first tasks PAM-8 performs is to check how much memory is in the system. It does this in a loop that writes and reads values in memory cells at 1K intervals. If what was written is not the same as what was read, PAM-8 concludes that it has reached the upper memory limit. By single-stepping, I found that this loop was only being executed once—indicating that the first comparison was failing even though the system had 56K of RAM. Since the processor had single-stepped correctly to this point, I concluded that op codes were being read correctly and thus the

problem was probably with writes. Further investigation revealed the following:

The original adapter works well in conjunction with Heathkit's 8K byte memory boards, but you can have a problem with the 16K byte boards. These boards require a falling edge from the system clock ( $\phi 2$ ) during a memory write request ( $\overline{\text{MEMW}}$ ). This edge is inverted on the memory board and used to clock half of a 74LS74, which initiates the write. (The 8K boards merely use  $\overline{\text{MEMW}}$  without reference to  $\phi 2$ .) When the HZ8 adapter is used the  $\overline{\text{MEMW}}$  signal is obtained by combining the  $\overline{\text{MREQ}}$  and  $\overline{\text{WR}}$  outputs from the Z-80. Unfortunately, the  $\overline{\text{MREQ}}$  and  $\overline{\text{WR}}$  signals produced by the Z-80 barely overlap the falling edge of the clock at the end of their durations. The result can be an inaccurate write or no write at all.

A solution to the problem is to run the Z-80 clock 180 degrees out of phase with the system clock. This places the falling edge of the system clock well within the duration of the generated  $\overline{\text{MEMW}}$ . The shift is easily done by removing two components from the original adapter; namely, the first inverter (7405) at pin 6 of the 8224 and its 1k pull-up resistor. (See Fig. 2.)

This modification solved my problem. The adapter now runs well in my system, which consists of 16K and 8K byte memory boards, an H17 floppy disk controller and an H8-4 serial interface board.

One final note: Since the single-step described in this article is a true hardware single-step, it may not be compatible with some of the non-Heath Company dynamic memory boards on the market. ■

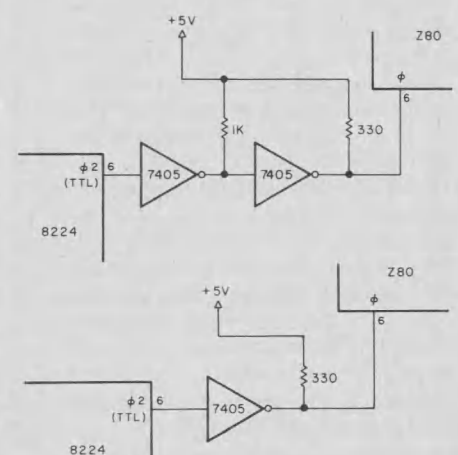


Fig. 2. Clock to Z-80 circuit in original HZ8 adapter (top). Clock to Z-80 circuit after modification (bottom).

# Game Digest



Edited by Dan Muse

## Birth of the Phoenix

*(Reviewed in Creative Computing, August 1982)*

**System Requirements:** Apple II 3.3 DOS 48K

**Manufacturer:** Phoenix Software, 64 Lake Zurich Drive, Lake Zurich, IL 60047

**Price:** \$22

**Comments:** "Birth of the Phoenix is a class 1 adventure for novice players," the review says. The manual gives the player information on the particular game and the genre in general.

"The game itself is a text adventure with several goals. The player must find certain treasures, but he must also help the Phoenix in a manner learned while playing the game.

"Birth of the Phoenix is a great introduction to the realm of adventure games," the review says. Reader Service number 401

## Congo

*(Reviewed in Creative Computing, August 1982)*

**System Requirements:** Apple II 48K, disk drive, joystick recommended

**Manufacturer:** Sentient Software, Inc., PO Box 4929, Aspen, CO 81612

**Price:** \$34.95

**Comments:** Congo has "spectacular graphics and a clever theme," according to the review.

You are on safari and are separated from your native guides. You must make your way up the Congo River. "Along the way you will see other survivors of your party stranded in native villages or awaiting your rescue on small islands in the river," the review says.

To save your mates, you must maneuver your hand-made raft past deadly obstacles in the river. You also must not get too close to the shoreline where crocodiles and white panthers patrol.

The game is frustrating at first, and a great deal of practice time is required to get used to the game, the review says; however, Congo is a "spectacular and colorful game." Reader Service number 402

## Chicken

*(Reviewed in Creative Computing, August 1982)*

**System Requirements:** Atari 400/800 16K

**Manufacturer:** Synapse Software, 820 Coventry Road, Kensington, CA 94707

**Price:** \$29.95

**Comments:** This is "a children's game which will keep many adults busy after the kids have been tucked in," the review says.

As a chicken, "You must catch in your cart all the eggs dropped by a fox scampering across the top of the screen," the review says.

Missing an egg will result in the egg breaking and a peeping chick appearing. For obvious reasons, you must "fight back the instinctual urge to sit on the eggs you drop," the review says.

"If you do plop down on a chick, a huffy farmer strides across the screen and gives you a boot," according to the review.

"The addiction level is high, and the game is refreshingly violence-free," the review says. Reader Service number 412

## Mouseattack

*(Reviewed in Creative Computing, August 1982)*

**System Requirements:** Atari 400/800 32K

**Manufacturer:** On-line Systems, 36575 Mudge Ranch Road, Coarsegold, CA 93614

**Price:** \$39.95

**Comments:** "If maze games appeal to you, so will Mouseattack."

Instead of eating as you go through the maze, you are a plumber, laying pipes as you go. "You are zealously pursued by a group of multi-colored rodents whose goal is to snuff you out," the review says.

Your only assistance is a couple of traps and a couple of cats. The traps don't hold the rats for long, and the cats are too scared to do much.

The game offers many challenging and innovative features, including a simultaneous two-player game, wherein you play against rodent and opponent at the same time. Mouseattack is "squeaking good fun," the review says. Reader Service number 408

## Twerps

*(Reviewed in Creative Computing, August 1982)*

**System Requirements:** 48K Apple II, 3.2

or 3.3 disk drive, paddles, joysticks optional

**Manufacturer:** Sirius Software, Inc., 10364 Rockingham Drive, Sacramento, CA 95827

**Price:** \$29.95

**Comments:** As Captain Twerp, your mission is to "bash your way through orbiting satellites and rescue a shipload of stranded Twerps."

"The game starts with a graphic of a spaceship exploding, and the escaped Twerps plummeting into holes on the planet surface, leaving only their antennae protruding," the review says.

You must get from your Twerpstation to the planet. If you run out of fuel, the game is over. You must also avoid Glingas and Gleepnoks, both of whom are trying to "relieve you of your rescues," according to the review.

"This is a well-planned program from beginning to end." Reader Service number 411

## ZX Galaxians

*(Reviewed in SYNC, May/June 1982)*

**System Requirements:** ZX81, ZX80, 8K ROM, 4K RAM

**Manufacturer:** Artic Computing, 396 James Reckitt Ave., Hull, N. Humberside HU8 0JA, United Kingdom

**Price:** £3.95, £1.00 shipping and handling in U.S.

**Comments:** "If you are a keen arcade player, then ZX-Galaxians is for you," the review says.

The player is attacked in deep space by formations of hostile Galaxians, and it is his mission to prevent them from attacking Earth.

The player gets ten points for each galaxian shot in formation and 20 points for those shot in mid-flight. The game's use of ZX81's graphics is good. "When your base gets hit either by a galaxian or by a galaxian's bomb, the explosions are quite good." Reader Service number 403





Welcome to the Game Room. Each month this section will feature Micro Game Digest, reviews of computer games currently available and articles dealing with the low-end, home/game computers—Atari, Vic. . . . So read on and let the games begin.

### Choplifter

(Reviewed in Softalk, July 1982)

**System Requirements:** Apple II, with 48K bytes, ROM Applesoft, and one disk drive.

**Manufacturer:** Broderbund, 1938 Fourth St., San Rafael, CA 94901

**Price:** \$34.95

**Comments:** "Choplifter is a delightful mixture of arcade excitement and graphics whimsy, executed with a realism seldom found in entertainment software," according to the review.

Your mission is to rescue your fellow countrypersons who are being held hostage by the merciless Bungelers. You have to swoop in with your helicopter and pick up the hostages, "providing you can find them."

There are tanks awaiting you at every touchdown. Should you destroy the tanks, "there are plenty of lethal aircrafts and the dreaded drome-homing mines to keep you on your toes," the reviewer writes.

"It appears a good deal of thought went into the details of Choplifter. The thoughtfulness is welcome. The game itself is fun," the review says. Reader Service number 404

### Dog Daze

(Reviewed in Creative Computing, September 1982)

**System Requirements:** 32K Atari, disk drive, two joysticks or 8K Atari, cassette drive

**Manufacturer:** The Atari Program Exchange, PO Box 427, 155 Moffatt Park Drive, B-1, Sunnyvale, CA 94086

**Price:** \$17.95

**Comments:** "Dog Daze is an excellent game. It combines the capabilities of the Atari and an unusual game concept to achieve a truly enjoyable game," the review says.

The object of the game is to get all the "fire hydrants at the top of the play area your dog's color," according to the review.

"Dog Daze is one of the few two-player games which allows both competitors to play at the same time." One hazard is that if your dog passes too close to an opponent's hydrant he must, like all dogs, stop to sniff for a few seconds. "While you are sniffing, your opponent's dog may be claiming all the neutral hydrants in sight," the review says. Reader Service number 413

### The Human Fly

(Reviewed in Creative Computing, August 1982)

**System Requirements:** 48K Apple, Disk Drive

**Manufacturer:** Computer Programs Unlimited, 9710 24th Avenue St. S.E., Everett, WA 98204

**Price:** \$29.95

**Comments:** In this game you attempt to climb the CPU Towers Building. You must avoid "angry police, unpredictable birds, falling flower pots, closing windows, earthquakes, menacing gorillas," according to the review. You will also be confronted by a "rising balloon (catch it and gain ten floors)."

The game is modeled after Crazy Climber, the review says, but there are some differences.

If the Human Fly falls, you see him "falling head over heels and eventually splattering on the pavement in a bloody heap, a somewhat gory but spectacular end to the climb," the review says. Reader Service number 410

### Bandits

(Reviewed in Softalk, July 1982)

**System Requirements:** Apple II, with 48K bytes, ROM Applesoft, and one disk drive.

**Manufacturer:** Sirius Software, 10364 Rockingham Drive, Sacramento, CA 95827

**Price:** \$34.95

**Comments:** "Bandits is a variation of the age-old invaders-type game, but with enough new twists and innovations of its own to make it one of the better of this genre—possibly the best," the review says. Reader Service number 405

### Protector

(Reviewed in Creative Computing, August 1982)

**System Requirements:** Atari 400/800 32K, cassette or disk

**Manufacturer:** Synapse Software, 820 Coventry Road, Kensington, CA 94707

**Price:** \$29.95

**Comments:** Protector is "exceptionally dramatic in its graphics and sound effects, and the animation is mirror smooth," according to the review.

This adventure game contains six levels of difficulty. As soon as a level loses its challenge, you can advance to the next level.

The graphics are the best thing about Protector. Sound effects and the title music are also good. Reader Service number 407

Action Quest is an arcade game—and it is addictive, well paced and fun

### Action Quest

(Reviewed in Creative Computing, August 1982)

**System Requirements:** 16K Atari 400/800, cassette/disk

**Manufacturer:** JV Software, 3090 Mark Ave., Santa Clara, CA 95051

**Price:** \$29.95

**Comments:** "Action Quest is a one player arcade-style game within an adventure format—and it is addictive, well paced, and fun," according to the review.

This is not a shoot-em-up type of game, and could almost be labeled an adventure game, the review says. Reader Service number 406

### Trailblazer

(Reviewed in Softline, July 1982)

**System Requirements:** Apple II, 48K, disk

**Manufacturer:** Zeta Systems, 1725 Adelaide Blvd., Akron, OH 44305

**Price:** \$29.95

**Comments:** Trailblazer "offers space exploration and trading for one to four players," the review says.

"Trailblazer maintains the tradition established by its noncomputer predecessors. It is good—and inexpensive relative to similar game programs on the market," according to the review.

"The game is played in four distinct phases. The object is to accumulate the greatest number of victory points in a predetermined number of rounds of game play.

"Players must bid against each other for limited supplies produced on known worlds in the galaxy. The bidding is open and competitive," the review says.

"Trailblazer is much more than Outer Space Monopoly... as you play, you must develop new marketing strategies and carefully plan ahead for several moves if you hope to survive against an astute opponent," the review says. Reader Service number 414

Juggler is absolutely delightful and unlike anything else currently on the market

### Juggler

(Reviewed in Creative Computing, August 1982)

**System Requirements:** 48K Apple, disk drive, paddle optional

**Manufacturer:** Innovative Design Software, Inc., PO Box 1658, Las Cruces, NM 88004

**Price:** \$29.95

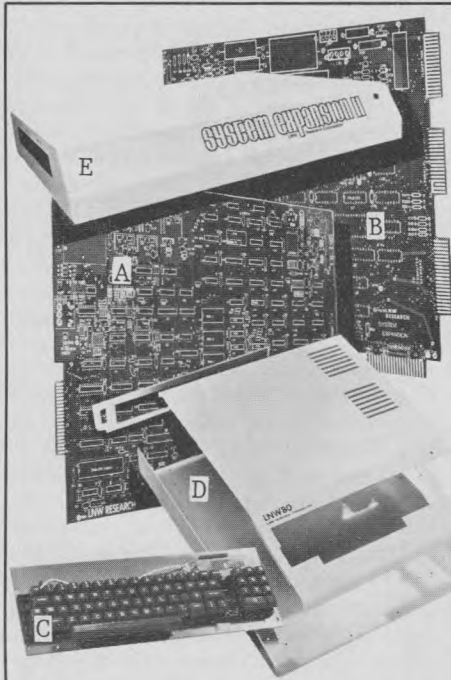
**Comments:** Juggler is "absolutely delightful and unlike anything else currently on the market," the review says.

In this game you are given various types of objects to juggle.

Balls and "tumblers" are launched into the air and "careen off a small inclined plane and hit objects the juggler is tossing into the air or the juggler himself," according to the review. Reader Service number 409

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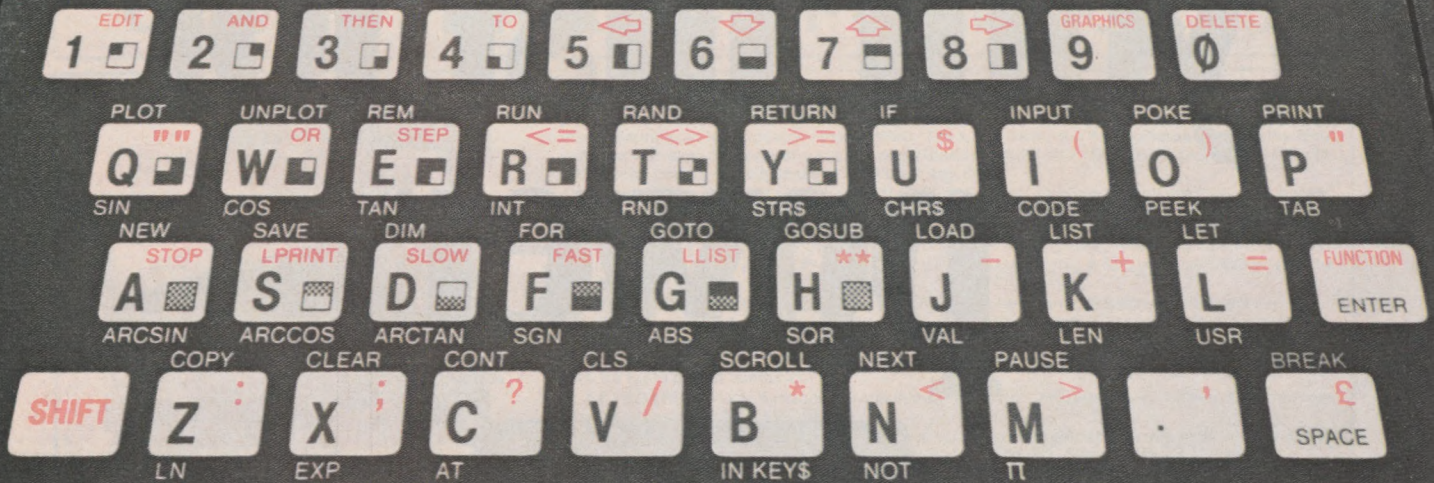
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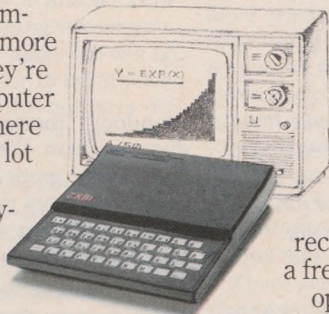
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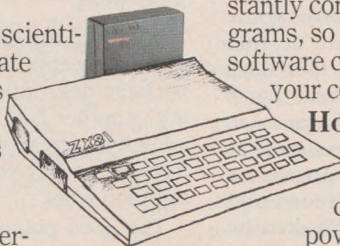
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# Meet Teddy, A Likable Garbage Man

Edited by Dan Muse

### Microwave

Out of the Pac-Man Genre, this game is Unique and enjoyable

The story line involves Teddy, an intergalactic salvage man, who must defend himself with microwave dishes (and, it turns out, the radiation from same) against alien varmints. These dishes are powered by power packs that—you guessed it—Teddy salvages. Boring?

After playing Microwave until 1:30 or later several mornings in a row, I can tell you that it is anything but boring. It is a very well put together game; the crummy storyline on the back of the package actually does nothing for the product. In fact, it was probably written to minimize sales, since word of mouth should make this a most successful product.

Microwave belongs to the Pac-Man genre of games, but with some added adventure-like features. There are nine different mazes, or levels, as they are called on the screen, each more difficult to penetrate. Teddy walks briskly in the direction chosen by (reassignable) keyboard keys or a joystick until he hits a wall, is eaten by aliens, blown up by time bombs left by the aliens, runs out of life support equipment or escapes to the next level.

The goal of the game is to have Teddy pick up all the tools and sundries scattered about the maze. When all of these are picked up, an exit appears and Teddy must pass through it to escape to the next level. The higher the level, the smarter (and faster) the aliens. Higher level exits are increasingly better guarded both from a passive (maze design) and alien response point of view. Each game begins with three chances for Teddy; if you make it to level 5—I did this early one morning—you get one extra chance. (A nice gesture, but it didn't help me).

Teddy has three defenses. The first one

is adroit finger-work by the player. This takes some time to develop. I tried to use a joystick but found that without automatic centering of the stick control, it is hard to maintain. I kept missing vital turns in the heat of the chase. The keyboard worked far better for me.

Teddy's second defense is the "powerful" microwave dishes. These can be dispensed at critical times, but only one may be active at a time. They are always focused to the rear of Teddy. The beams of the dishes are instantly fatal to any alien caught in them. Otherwise, aliens are usually repelled—but sometimes killed—by the radiation which runs along a maze path until it hits a wall. Teddy can walk through the beams with no apparent ill effect.

The third defense is to stop action. Though probably considered a form of cheating by Microwave enthusiasts, action can be stopped anytime in the game by typing a control C. (Try to do that when you are surrounded on four sides by converging aliens if you think this is cheating.) This command is supposed to be used to allow keyboard reassignment if you don't like the left-right arrows for side motion, A and Z for up and down and space bar for dish release defaulted by the program. Action will be instantly stopped for your casual perusal and can be restarted by simply reassigning the keys to their normal value. (This is a very painless task, and worth the work if you can stop the show in time.)

Sound effects and music are very good and can be turned on and off with a control S. After four or five hours they get boring, even when well done, and this refinement shows the detail that was spent on the game. The last three highest scores, along with your initials, are saved on a scoreboard displayed at the end of the game. Another nice touch.

I enjoyed watching the motion of the aliens. I think I have found three different modes of behavior on their part. Mode 1 is

"random" motion. Unless something disturbs them, they will follow the same path every game. Level 1, the easiest maze, uses this mode most of the time. (There is a route that Teddy can follow that works just about all the time.)

Alien mode 2 seems to involve "alien seek" on poor Teddy. You will discover this mode very quickly in level 2, although after a little while, if they don't get you, the alien chase becomes more like random milling about.

Mode 3 is invoked when a maze is nearly solved and you try to get Teddy to the exit. Level 2 usually has one or two aliens guarding the single passageway to the exit. Higher levels have all available aliens buzzing around well-guarded exits like hornets. Quick-witted, clever strategies and careful use of the microwave dishes can obtain access to these exits.

What are the bad points of the game? At first it seems childishly simplistic; the package description is entirely misleading. Another bad point is that it is very addictive, apparently for all age groups from seven (my youngest) to 39 (I won't mention who).

The good points are only everything that makes a good computer game—good sound effects, animation, challenge. And intense action for 30 to 60 seconds (if you are lucky), followed by instant gratification or annihilation, continues for as long as you choose. Skill and luck will be required to penetrate the deeper levels. Skill in this case is fun to develop (your wife and family will probably have another word for it) and you already know about luck.

I thoroughly liked Microwave and enthusiastically recommend it to everyone. It is an arcade quality game for the Apple II and a step above Apple Invaders. Control is crisp, and attention to detail of the game is consistently high and professional.



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From one to six players may try their skill and cunning in investments. Each player will be given \$5000 at the beginning of the game. The game is played in year cycles, with each turn being the equivalent of one year. The game is over after ten "years" of trading, and the player who has amassed the greatest fortune will emerge as the winner.

When the game begins, the computer will announce if it is a Bull or Bear market. You will be expected to use this information wisely. The computer will next ask you if you wish to see its own version of the Dividend Announcement—Avalon Hill International News Bulletin, or the Stock Split/Bankruptcy screens.

These screens display some very important information on the companies that you are investing in and should be used on every turn; even if you don't view them, they will have an effect on the outcome of the game. They give such relevant information as which companies are paying dividends and how much; what, if any, companies are having a stock split or going bankrupt; and important news items that will have an effect on the company involved.

The news items may be such things as a congressional vote to stop supporting ore prices due to a stockpile, or a company that had a fire announcing that it does not have enough insurance to cover the losses. These are all very interesting and important when you are planning where to invest your money.

The Avalon Hill International News Bulletin is presented as a video ticker-tape which runs across the top of the screen, giving you stock prices throughout the game. It also lets you know when the market is open for trading.

Each player is given his position when it is his turn to play. The position is determined by the amount and value of stock owned by the player and his net worth at

the beginning of trading for that year. The video ticker-tape runs across the top of the screen displaying the current price for the stock. The player may then choose to buy or sell as many shares of the stock as he owns or can afford.

You will have a choice of ten companies to invest in ranging from Central City Municipal Bonds, which is the safest investment, to the speculative investment, Uranium Enterprises, Inc. There are many types in between to choose from—Mutual Funds, Auto Industry companies and utilities, for example.

Any company that reaches a price of \$150 per share will usually declare a two for one split, and holders of that stock will have their amount doubled. The corresponding price will also be cut in half. Any stock price that falls below zero will cause the company to declare bankruptcy, and any player holding that stock will lose all financial interest in it. At the start of the next turn, the bankrupt company will start fresh with a trading price of \$100, and players may then buy it again if they wish.

There are also two player-aid routines that the players may use to help them decide whether to buy or sell a stock. The first is the price history routine—with this the player can see the price history of a stock for all the "years" the game has progressed. This will give you a fairly good idea about the direction a stock is taking. You may decide to ride out a downslide or sell if you feel the security has reached its peak. This is a very useful item to rely on for the novice.

The second player-aid routine is a Bar Graph Analysis. With this you can select three stocks at a time and have the prices plotted on a bar graph for comparison. You can only display three stocks at a time so if you own more than that you will have to run an additional analysis.

The more "years" that have passed, the more you will get out of these aids. They can be called upon whenever it is your turn so make the most out of them; they can make the difference between poverty and riches.

The instruction book provided is well-written and easy to understand even for the beginning investor. It contains all the information you will need to load the program and play the game. The eight-page manual even comes with a glossary of terms used in the investment world so a total novice can play and enjoy this game.

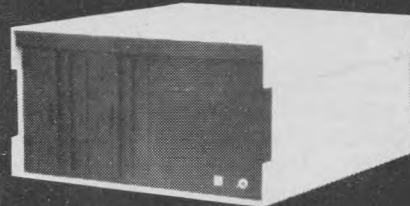
Computer Stocks and Bonds lets you use your investment skill and strategy to make (or lose) vast fortunes without investing more than the price of the program. Invite your friends over and see who is the sharpest investor, or just play it by yourself and sharpen your decision-making skills. Who knows? It may pay off at the real Stock Exchange.

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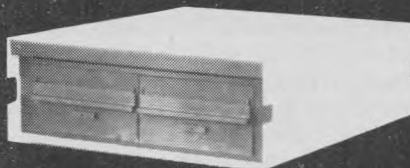
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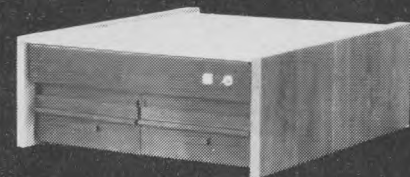
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## Educational Software For Kids

### "Sammy Sea Serpent" Helps to develop Children's skills

The programs in Educational Software for Kids are not shoot-em-up arcade games where you must defend the universe and destroy all the aliens before they get us; they are not maze-like adventures that take us to the edge of our sanity. These are a few of the educational games available to teach the young.

As an added benefit, they also help to orient the young to the use of computers. They help kids become interactive with computers and not hold them in awe. It is quite possible that a child may fear the computer if the only exposure he gets to it is in science fiction.

These programs have been tested by the toughest critics I know—my own kids. They have run the cycle from arcade games on the TV to where they are now—the Atari 400. The oldest one already has her eye on my Atari 800

("...but, Dad, it's easier to type"). Now if you can bear to back away from the keyboard and let the kid have a go at it, you may be interested in these programs.

Sammy the Sea Serpent and Story Builder/Word Master are two of the programs available from Program Design, Inc. They are in a category named by PDI as the Children Challengers.

There are currently nine programs in this category, ranging from preschool IQ builder to addition with carrying. This is a very good first program for children. It is done in storybook format with very good graphics. The story involves Sammy the Sea Serpent whom the child must guide through the story with the use of joystick controllers.

The story is narrated by use of the cassette audio track and gives the background of the story and instructions to the participant. The program helps to develop eye/hand coordination. The child must guide Sammy through mazes and gardens. The child must also help Sammy find his food so that he can grow up and continue on his journey.

In one instance the child is given a time limit on moving Sammy to find his food. If the child doesn't get him there on time the bug flies off and Sammy must be taken to another one.

This gives the participant something of a goal to work toward without penalizing him if he should fail the first time.

The story is well-written and should give the child hours of use.

The cassette's reverse side involves games that require joysticks. They run 16K (Atari) and are recommended for children ages four to seven.

Story Builder/Word Master is another educational program available from PDI. It is available in 8K for the Atari on cassette or diskette and 32K for the Apple

on diskette. It is recommended by the manufacturer for ages nine or older.

This program is used to help the child develop his grammar skills. There are three separate programs on side 1 of the cassette. In the first program the child is given the definitions of a noun, a verb and an adjective. The computer puts different sentences on the screen and asks the child, for example, which is the noun. The word that is sought is in inverse video so it is easy for the child to spot it.

The child makes his choice by entering the corresponding number. The computer then tells the child if this is correct. If incorrect, the computer gives the child another chance. If it is wrong on the second try the computer gives the child the definition of the type of word it is looking for, and gives another chance at it. If the answer is right the child is given an audio and visual display letting him know, and then another sentence is put on the screen for him to try.

The only complaint I had with this program is the almost obsessive use of the word "yucky" in the program. It would seem that somewhere in the English language there must be a better choice.

The next program is called Fractured Nursery Rhymes. In this program the child takes what he has learned in the first program and puts it to use. The program asks the child for a noun, a verb and an adjective and places them into strategic spots in familiar children's poems.

It then puts them on the screen for the child to read, allowing him to see if his words fit in the same position as in the program. It helps the child to understand in what context the words are used. The rhymes that are on the screen can be quite amusing, as my nine-year-old found out.

The third program is a continuation of the second and is called More Fractured Nursery Rhymes. It features different rhymes in case the player wants to look at some new poetry.

On the reverse side of the cassette is a game which is fun and challenging for both kids and adults. In this game the computer selects a three-letter word, and you have ten tries to guess what it is. The computer will show how many letters you have correct and in the right position, and how many letters you have correct but in the wrong position. This is an old game, but it is still challenging and fun to play.

These are only two of the many educational and challenging programs available from PDI. They have programs for kids of all ages, and I hope to acquire more of them in the future if the quality of the programs is on par with what I have already seen. Both programs are \$23.95 on diskette and \$16.95 on cassette.

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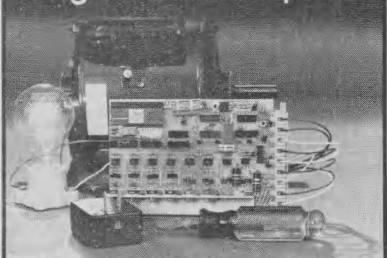
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# Squeeze the Most Out of Your VIC-20

*Learn how to use the color dot and high-resolution capabilities of the VIC-20 to generate some super game graphics.*

By Jeff Knapp

Commodore's VIC-20 microcomputer has been in people's hands for some time now, and users are enjoying its many features: color, sound effects, music and character graphics. But for all its facilities and ease of use, there's always a computer hacker who wants to squeeze more out of his machine.

One feature that has been "squeezed" is the capacity for programmable characters. Several people, working independently, have devised programs for constructing a user-generated character set; and by the time you read this, Commodore may have its version on the market.

Two other, related, features may be useful to you. One is the facility for high-resolution black-and-white dot-addressable graphics, and the other is medium-resolution eight-color dot-addressable graphics.

## Programmable Characters

Those of you familiar with the VIC may understand the principle behind user-generated characters but wonder, since the VIC screen memory is only 506 bytes, how you can get hires when those bytes are not bit-addressable. The answer is to use the VIC's programmed character generator, and when a hi-res dot is required, generate a custom-built character on the fly.

The VIC computer gets its name from the VIC (Video Interface Chip) integrated circuit that Commodore's MOS Technology subsidiary manufactures. This chip governs all of the

screen and sound functions. It includes 16K address space, on-chip generation of 16 colors, screen centering, screen grid of up to 192 horizontal by 200 vertical dots, two selectable graphic character sizes, on-chip sound system (three voices, white noise and volume), two on-chip analog-to-digital converters, 16 addressable control registers, light pen/gun input and two modes of color operation: hi-res and multicolor.

This powerful little piece of plastic has a lot of capability. Table 1 shows the VIC register names and the decimal addresses they occupy. Note CR5; this register controls the addresses at which the VIC chip will expect to find the screen memory and the character generator ROM. By altering this register, we can make the VIC chip look at an alternate programmed character generator. Since each character is composed of eight consecutive bytes, you can build

your own characters by setting bits on or off in those bytes.

When CR5 contains 240 (decimal), the VIC chip looks at the uppercase/graphic characters of the character generator ROM. When CR5 contains 242, the lowercase/uppercase character set is used. If you poke CR5 with 255, the character set is considered to start at address 7168 in the top of the VIC computer RAM. Eureka! Since you're in free RAM, it should be a small matter to design custom characters and poke the appropriate values into the required bytes. Fig. 1 illustrates how this is done.

By laying out an 8-by-8 grid, and weighting the columns as shown, you can fill in the blocks to design a character. When you are done, horizontally sum the column weights of each row. In this example, the top row has a sum of 24 (16+8), the second row has a sum of 36 (32+4), etc., with the last three rows having sums of 129

Register name	Function	Address
CR0	Horizontal centering	36864
CR1	Vertical centering	36865
CR2	Number of columns	36866
CR3	No. rows, character size	36867
CR4	Current scan line	36868
CR5	Character & video addresses	36869
CR6	X position of light pen	36870
CR7	Y position of light pen	36871
CR8	Digitized value of POTX	36872
CR9	Digitized value of POTY	36873
CRA	Tenor tone generator	36874
CRB	Alto tone generator	36875
CRC	Soprano tone generator	36876
CRD	White noise generator	36877
CRE	Volume control	36878
CRF	Screen color control	36879

Table 1. VIC register names and the decimal addresses they occupy.

Jeff Knapp (1823 7th Ave., Charleston, WV 25312) manages a Commodore dealership in Charleston.



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Fig. 1. An example of VIC character generation.

Using this simple technique, you can create a character in an 8-by-8 grid and use that character in a program. Commodore, for example, used this technique to create the "meanies" in the VIC game program, Blue Meanies from Outer Space.

Now you can use the same technique to display dot-addressable graphics on the VIC screen. The procedure is simple: starting with X and Y coordinates of the dot to be lit (or unlit), calculate the screen byte position within the eight bytes that make up the screen position, create a character, put the new character in the screen byte position, and set or clear the bits necessary to make the desired pattern. For example:

horizontal byte =  $67/8 =$  byte 8 with a remainder of 3

vert  
of 7

screen byte will be  $7680 + (22 * 6) + 8 = 7820$

create the next available character, e.g., @ (this would be character 0)

poke 7820,0

bit position will be the 3rd bit of the 7th byte of

character 0

byte 7 =  $7168 + (0 \cdot 8) + 7 = 7175$  (remember the formula for finding the byte, above)

bit position three is weighted as 32, so poke  
7175, 32

By poking the screen RAM with the appropriate character (in this case, @) and then defining that character as necessary, you can have dot-by-dot control over the screen. The program listing shows a simple way of getting started. Line 10 clears the screen and sets the output to blue, then lowers the memory ceiling to make room for the new alphabet. The CLR statement ensures that all pointers in the computer are set correctly.

Array `C[x]` keeps track of which characters are available to be redefined. Line 11 declares character 32 occupied, and changes the VIC chip pointers to the new character set and the background/border to black. Line 12 defines a function that makes it simple to find out which byte is to have bits set. Lines 15 through 20 create an array of bit weights and clear all bytes of our new character set.

Lines 10-20 should be at the head of your program. Lines 1000-1070 comprise the actual plotting subroutine, and follow the procedure set

forth above with the addition of line 1030. Line 30 checks to see if the calculated screen position already holds a character; if it does, alter the existing character instead of creating a new one.

Line 1050 prints on the top line of the screen the character being defined; it can do this by calculating the proper value and displaying it in reverse video. While you're in the user-generated character mode, you can display any of the normal uppercase characters by printing them in reverse video. Line 1060 tests for defined characters and skips them until it finds a blank one to use.

Before running a program using this routine, press the stop and restore keys simultaneously, or else poke 36879, 27 inside the program. This resets the video to a white background and cyan border. Note that although the program sets the output to blue, the dots in the screen are white. This is because only printed output is blue, and poked output such as we use for plotting takes on the background color.

### Medium-Res

## Dot-Addressable Color Graphics

That brings us to color graphics.

```

10 PRINT"Sb":POKE52,28:CLR:DIMC{64}: rem lower memory ceiling
11 C{32}=1:POKE36869,255:POKE36879,8 rem set alphabet & field
12 DEF FNA{C}=7168+{C*8}+Y2 rem define character calc
15 FORX=0TO7:READB:B{X}=B:NEXT rem read bit weights
17 DATA128,64,32,16,8,4,2,1
20 FORX=7168TO7680:POKEX,0:NEXT:C=0:PRINT rem clear alphabet
30 rem define x coordinate here
40 rem define y coord here
50 GOSUB 1000 rem gosub plot routine
60 :
70 :
80 :
90 :
100 END
1000 X1=X/8:Y1=Y/8 rem calculate byte pos
1010 X1=INT{X1}*8:Y1=INT{Y1}*8:X2=X-X1:Y2=Y-Y1 rem calculate bit pos
1020 S=7680+{Y1/8}*22+{X1/8} rem calc screen pos
1030 IFPEEK{S}<>32THENC=PEEK{S}: rem if screen pos is
    POKEFNA{C},PEEK{FNA{C}}ORB{X2}:GOTO1050 occupied, alter char
1040 POKES,C:POKEFNA{C},B{X2}:C{C}=1 rem if not, start new
1050 PRINT"s]]r"CHR$(C+64) rem print char used
1060 C=C+1:IFC{C}THEN1060 rem increment char count
1070 RETURN

```

Cursor Legend: s=home cursor

S = clear screen

b = print in blue

| = cursor right

r = reverse video

*Program listing. Basic program to define programmable characters on the VIC-20.*



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You can get much the same results, but in color, using the VIC chip's multicolor mode instead of the hi-res mode. I won't go into great depth with this, referring you instead to Commodore/MOS publication "6560/6561 Video Interface Chip," available from Commodore, 950 Rittenhouse Road, Norristown, PA 19403 (phone 215-666-7950). This is a complete, albeit technical, description of the VIC chip and its capabilities.

Take a look again at Table 1. CRF bits 0-2 select one of eight colors for the border area of the screen. Bit 3 determines whether a character will be displayed in normal or reverse video. Bits 4-7 determine one of 16 colors for the background of all characters.

This register, as you can see, controls much of the color, but only on a screenwide basis. To get bit color control, you must use this register with others, and there is one for each position on the screen. They're called Color Pointers; they reside at decimal address 38400 and continue for 506 bytes, giving a one-for-one correspondence to the Screen RAM that

Let's see someone  
use the hi-res and  
multicolor capabilities  
of the VIC to do  
some super game like  
Missile Command or  
Asteroids. . . .

was poked into a short time ago.

These pointers contain the color information for each character printed on the screen, and determine whether that character will be displayed in hi-res or multicolor mode. The most significant bit of each color pointer makes that determination. If the bit is 0, then that character is displayed in hi-res; if it contains 1, then the displayed character is in the multicolor mode.

With hi-res selected, there is a one-to-one following of bit to background color. With multicolor selected, each two bits of a character byte (remember there are eight bytes to a character) correspond to *one* bit on-screen, and the color of that dot is determined by a code comprised of those two bits.

Unlike hi-res mode, which allows only two colors to be displayed per character, multicolor allows up to four colors per character. However, since two bits of cell data correspond to one bit on-screen, multicolor has half the resolution of hi-res. That is to say, an 8-by-8 character now maps out at 8-by-4 (eight lines of four each). The same memory is required, but it's mapped differently.

In multicolor mode the two bits that make a dot will select one of the four colors for that dot. The four codes created by those bits tell the VIC chip where to get color information. The four codes and where they point to are shown in Table 2.

00 = background color (bits 4-7 of CRF)  
01 = exterior border color (bits 0-2 of CRF)  
10 = foreground color (color pointer RAM)  
11 = auxiliary color (bits 4-7 of CRE)

Table 2. Two-bit codes that point to color information in the VIC.

You should understand that the four codes are not colors, but pointers that indicate where the color information is held. This allows greater color capability, as each code pointed to has either three- or four-bit resolution.

Suppose the bit pattern were 0001-1011. The first two bits would be in the background color, the second two in the border color, the third pair in the foreground color, and the final two in the color described in the auxiliary color register.

If you want to see how this works, list the plotting routine (or any other program) on the screen. At the bottom of the screen, type the following direct command and press return:

FOR X=38400 TO 38906:POKE X, 200:NEXT

If the screen was in its normal cyan-border/white-background combination, you should see portions of the characters get wider and turn black, to give narrow blue segments and wide black ones in each character. Retype the line, but this time, poke X, 255: instead. The colors change from blue and black to blue, black and orange.

### Using the Hi-Res Routine

You may use the hi-res plotting routine anytime you need to create complex or unusual shapes. It's interesting to feed the routine coordinates derived from the VIC's transcendental functions. But there is one point of which you should be aware: Because you only have 512 bytes in which to redefine the alphabet, and each character takes up eight bytes, you can only define 64 new characters. So you must be sure that your program prevents any attempt to create any character out of range. Also, this routine does not check for out-of-range points to be plotted. Horizontal resolution is 176 dots and vertical resolution is 184 dots.

And now for some challenges. Let's see someone use the hi-res and multicolor capabilities of the VIC to do some super game like Missile Command or Asteroids—or to plot the shapes of the continents for students to identify. And take a serious look at using the VIC's two A-D converters (CR8 and CR9) along with the user port and some external sensors to create a low-cost, highly flexible biomedical monitor. Try plotting heartbeat and blood-pressure waveforms. The uses of the VIC in the real world are limited only by your imagination. ■

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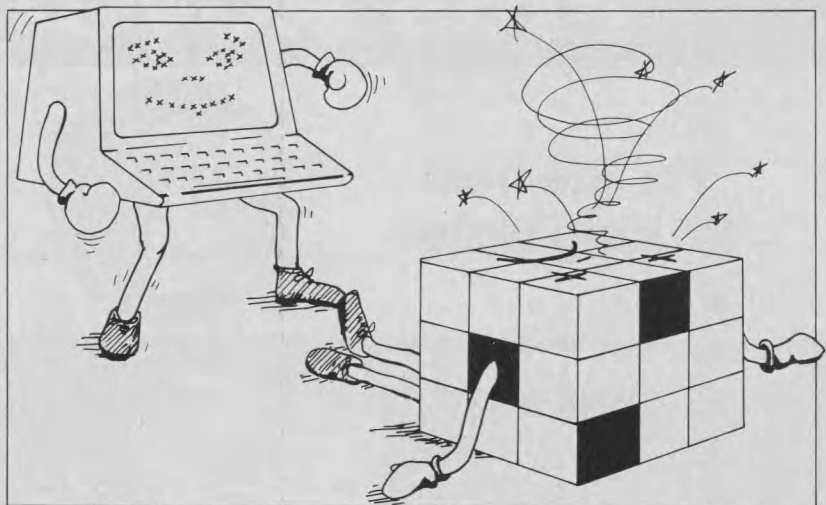
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# Conquering the Cube



Does your Cube have you beat? This monthly column will feature solutions and variations to the infamous Rubik's Cube. We welcome your contributions of material relating to the Cube and your Apple, Atari, Commodore, Heath or IBM computer.

The purpose of this program (Listing 1) is to provide a useful tool for understanding and solving the cube. It was written in TSC Basic on a SWTP 6800 computer with 32K bytes of memory but it has been run on an Apple II with Applesoft after only a few modifications (see Listing 2). In addition this program will interpret and execute move sequences that you enter.

My goal in writing this program was not to achieve the shortest solution; rather it was to progress to the solution in easy-to-recognize plateaus or stages of completion which may be followed on an actual cube.

Cube status may be displayed at each plateau. If the result of manual moves should not agree with the display, it is a simple matter to re-enter the status of the cube and start over.

If you have already glanced at the program, you are probably concerned with its length. To get started you do not have to enter the whole program at once. The solution portion of the program may be omitted initially. You are still left with a program that will initialize the cube colors to its pristine state, execute move commands and display cube status.

Before moves can be defined, it is necessary to develop a precise move notation. A unique move designator is required for each of the six cube faces. This designator must then be interpreted and executed by this program. The face designators chosen are U, D, L, R, F and B for up (top), down (bottom), left, right, front and back.

To specify a 90-degree clockwise face rotation (when looking directly at that face) you simply append a + to the face character. An appended - specifies a counterclockwise 90-degree rotation. For example, an F+ entry causes the front face to rotate 90-degrees clockwise. In practice, the + is assumed and omitted for clockwise moves. Note that two sequential 90-degree moves are specified by appending 2 to the face character.

Since two sequential 90-degree moves in either direction have the same end result, this single notation is sufficient for both. While on this point, any four identical sequential 90-degree moves have no effect since you simply end up where you started.

Center slices are rotated either clockwise or counterclockwise by appending either + or - to X, Y or Z. X is the slice between L and R. The entire cube is rotated 90 degrees clockwise by the move commands X>, Y> or Z> or counterclockwise by X<, Y< and Z<.

Two special move command designators are used. P is used for ten predetermined move sequences (P0 through P9) defined in the program. These sequences are used repeatedly in solving the cube. Designator C is used for three move sequences (C+, C- and C2) that are functionally equivalent to Y>, Y< and Y>Y>. Its only use is to facilitate the reduction of answer strings to simplest terms.

A move command can always have two characters. An example of a valid move sequence is F + L - X> B2 P4 C+. Spaces may be inserted for readability as



desired. They are ignored by the program. It is never permissible to represent a move by using three characters.

### Control Commands

The program provides seven control commands. They are start, draw, color, save, load, exit and solve. When entering a control command, only the first two characters need be entered. (If a single character is entered, it will be interpreted as a move command, resulting in either an unwanted move or an error message.)

On entering the program, you must choose the display format. Option 1 gives both the solution and a cube display at each plateau level. Stops occur at each plateau to give you an opportunity to copy the results.

To continue on after a stop, simply enter X <CR>. Option 2 outputs only the solutions at each plateau without any stops or cube displays. Option 3 gives the solution and a display at each plateau without stops.

If you are using a different Basic (other than TSC Basic for SWTP 6800) you must determine the maximum concatenated string length, which is 128 in my Basic. Change this value in line 700 to agree with your Basic if it is less than 128.

Cube solution is programmed in the following manner. First the program logic determines the position of certain cubies associated with the particular solution plateau being solved. Based on interpretation of this information, a series of internal move commands is generated. These commands are executed and saved as a move command string.

When a solution plateau is completed, the cube has been moved in accordance with the saved command string. Thus, the command string consists of the moves necessary to achieve that plateau level. In most cases the command string may be reduced to a simpler form. This is done before the solution is printed. If, at any time, the move command string exceeds the maximum allowable concatenated length, the string is automatically reduced and printed as part of the solution after which the program continues with the rest of the solution.

Six major plateaus are used:

- plateau 1 places all four back face edge cubies in proper location;
- plateau 2 places all four back face corner cubies in proper position, completing the back face;
- plateau 3 places the front face corner cubies in their correct cubicles;
- plateau 4 color aligns the front face corner cubies;
- plateau 5 positions the front face edge cubies, completing the front face;
- plateau 6 completes the centerslice between the front and back faces, solving the cube.

P move command strings are sequences of moves that are frequently used. They are defined by the program as follows:

```
P0 = U + F2U -
P1 = R - F2R +
P2 = F2R - F + R + F -
P3 = X - F + X +
P4 = F + X - F2X +
P5 = L - Z - L + L + Z + L -
P6 = R + R + Y + R + R + Y -
P7 = Y - U - Y - U - Y - U + U + Y + U - Y + U + U +
P8 = U - F + F + U + L + U + L + U - L - U - F + F + U + F + F +
P9 = U - F + F + U + F + U - F + U + F + F +
```

In general, their use only changes a limited portion of the cube, leaving the rest unaffected. If, for example, you enter P8 and note the resulting change from the pristine state, you see that the bottom two front face corner cubies have been exchanged without affecting the back face.

It is, as I have mentioned, not necessary to enter the whole program at once. You can get started by entering lines 10 through 910 and lines 1650 through 2680. With this portion of the program you can initialize the cube face colors to the pristine state, enter move strings and display the cube state. Other sections can be added later as desired. ■

Listing 1. Rubik's cube program in TSC Basic.

```
0010 REM RUBIK'S CUBE SOLUTION
0020 REM KENNETH W. COOPER JR.
0030 REM
0040 DIM F(3,3),U(3,3),B(3,3),D(3,3),L(3,3),R(3,3)
0050 DIM S$(6),M(54),W(3,3),P$(9)
0090 P$(0) = "U-F2U-"
0100 P$(1) = "R-F2R+"
0110 P$(2) = "F2R-F+R+F-"
0120 P$(3) = "X-F+X+"
0130 P$(4) = "F+X-F2X+"

```

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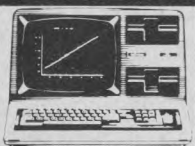


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## Listing 1 continued.

```

0140 P$(5)="L-Z-L+L+Z+L-"
0150 P$(6)="R+R+Y+R+R+Y-"
0160 P$(7)="Y-U-Y-U-Y-U+Y+U-Y+U+U+"
0170 P$(8)="U-F+F+U+L+U+L+U-L-U-F+F+U+F+F+"
0175 P$(9)="U-F+F+U+F+U-F+U+F+F+"
0185 REM STOP=STOP,SOL=SOLUTION,DRW=DRAW CUBE
0190 PRINT "ENTER 1=STOP,SOL,DRW 2=SOL 3=SOL,DRW";:INPUT K$
0200 IF K$<"1" OR K$>"3" THEN 190
0210 GC=VAL(K$)
0220 REM SIDES:F=FRONT,U=UP(TOP),B=BACK
0230 REM D=DOWN(BOTTOM),R=RIGHT,L=LEFT
0240 REM COLOR INIT. BY NEXT FOUR LINES
0250 FOR Y=1 TO 3 : FOR X=1 TO 3
0260 F(X,Y)=ASC("W") : U(X,Y)=ASC("R") : B(X,Y)=ASC("B")
0270 D(X,Y)=ASC("O") : L(X,Y)=ASC("Y") : R(X,Y)=ASC("G")
0280 NEXT X : NEXT Y
0290 REM COMMAND LOOKUP TABLE
0300 EE=0:PRINT:PRINT"ENTER COMMAND ";:INPUT Z$
0310 W=0:J=0:A$="":GB=LEN(Z$):IF GB<2 THEN 430
0320 IF Z$=LEFT$("SOLVE",GB) THEN PRINT "SOLVE:": J=1
0330 IF Z$=LEFT$("DRAW",GB) THEN PRINT "DRAW:": J=2
0340 IF Z$=LEFT$("COLOR",GB) THEN PRINT "COLOR:": J=3
0350 IF Z$=LEFT$("SAVE",GB) THEN PRINT "SAVE:": J=4
0360 IF Z$=LEFT$("LOAD",GB) THEN PRINT "LOAD:": J=5
0370 IF Z$=LEFT$("START",GB) THEN 190
0380 IF Z$=LEFT$("EXIT",GB) THEN END
0390 REM
0400 IF J=0 THEN 430
0410 ON J GOSUB 820,1670,1440,920,980
0420 GOTO 300
0430 K=1 : REM REMOVE SPACES
0440 IF K=LEN(Z$) THEN PRINT Z$: : GOTO 480
0450 IF MID$(Z$,K,1)<>" " THEN K=K+1 : GOTO 440
0460 Z$=LEFT$(Z$,K-1)+RIGHT$(Z$,LEN(Z$)-K) : GOTO 440
0470 REM CALL INTERPRETER SUBROUTINE
0480 GOSUB 530 : IF EE<>1 AND W7=0 THEN 480
0490 GOTO 300
0500 REM
0510 REM MOVE INTERPRETER
0520 GOSUB 690:W=0:W7=2
0530 W=W+1 : Q$=MID$(Z$,W,1) : W$=MID$(Z$,W,2)
0540 IF Q$="" THEN W7=1 : RETURN
0550 IF Q$="P" THEN W7=2 : GOSUB 740 : GOTO 530
0560 GOSUB 1880 : IF R=0 THEN RETURN : REM (ERROR)
0570 IF W$="C2" THEN L1=0:GOSUB 1960:W=W-1:GOSUB 1960:GOTO 530
0580 IF W$="C+" THEN Q$=">" : GOTO 640
0590 IF W$="C-" THEN Q$="<" : GOTO 650
0600 IF Q$="C" THEN Q$=">":W=W-1:GOTO 640
0610 Q$=MID$(Z$,W+1,1)
0620 IF Q$="2" THEN L=2 : W=W+1 : GOTO 670
0630 IF Q$="-" THEN GOSUB 1840
0640 IF Q$=">" THEN L1=0 : GOSUB 1960 : GOTO 530
0650 IF Q$="<" THEN L1=1 : GOSUB 1960 : GOTO 530
0660 IF Q$="+" THEN W=W+1
0670 FOR W9=1 TO L
0680 GOSUB 2390 : NEXT W9 : GOTO 530
0690 REM BUILD MOVE STRING. PRINT IF TOO LONG
0700 IF LEN(A$)+LEN(Z$) < 128 THEN A$=A$+Z$ : RETURN
0710 K$=Z$:GOSUB 1040:Z$=K$:GOTO 700
0720 REM GO DO 'P' COMMAND
0740 H$=Z$ : W8=W : W=0
0750 Z$=P$(VAL(MID$(Z$,W8+1,1)))
0760 GOSUB 530 : IF W7=0 THEN 760
0770 W=W8+1:IF Z$="" THEN Z$=H$ : GOTO 1930
0780 Z$=H$ : RETURN
0790 REM
0800 INPUT "PAUSE";H$
0810 GOSUB 1670:INPUT "PAUSE";H$ : RETURN
0820 REM SOLVE CUBE ROUTINE
0830 GOSUB 1580 : IF EE=1 THEN 300 : REM CHECKSUM ERROR
0840 GOSUB 930 : REM SAVE COLOR
0850 FOR KK=1 TO 6 : GOSUB 880
0860 ON KK GOSUB 3880,4180,2700,3030,3440,3620
0870 NEXT KK
0880 IF GC=1 THEN GOSUB 800
0890 IF GC=3 THEN GOSUB 1670
0900 RETURN
0910 REM
0920 REM SAVE CUBIE COLORS
0930 FOR Y=1 TO 3 : FOR X=1 TO 3 : J=X+3*(Y-1)
0940 M(J)=F(X,Y) : M(J+9)=U(X,Y) : M(J+18)=B(X,Y)
0950 M(J+27)=D(X,Y) : M(J+36)=L(X,Y) : M(J+45)=R(X,Y)
0960 NEXT X : NEXT Y : RETURN
0970 REM
0980 REM RELOAD CUBIE COLORS
0990 FOR Y=1 TO 3 : FOR X=1 TO 3 : J=X+3*(Y-1)
1000 F(X,Y)=M(J) : U(X,Y)=M(J+9) : B(X,Y)=M(J+18)
1010 D(X,Y)=M(J+27) : L(X,Y)=M(J+36) : R(X,Y)=M(J+45)
1020 NEXT X : NEXT Y : RETURN
1030 REM
1040 REM REDUCE AND PRINT SOLUTION
1050 FOR K=1 TO LEN(A$) STEP 2
1060 B$="" : C$=""
1070 W=B : Z$=MID$(A$,K,W)
1080 IF LEFT$(Z$,1)="P" THEN 1310

```

(continued on page 122)







# IBM Update

*Peripheral and software developers are busy bringing to realization the potential hidden inside this \$1600 personal computer.*

By Frank Pozar

**F**ive tests determine if a new business system is worth its salt:

- the quality of its video display and keyboard
- the speed and efficiency of the microprocessor
- the amount of memory
- the quality of the support programs
- the amount of permanent (disk) storage.

IBM's personal computer passes the first four tests rather well and holds great promise for the fifth. But while IBM did its usual good job, it still has to overcome a shortage of programs and a few minor problems such as expandability, a finicky color adapter, expensive components and a lack of good beginners' manuals.

## Too Many Pieces

IBM designed the Personal Computer to be modular, and modular it is. Mine has all five slots filled with adapters, for a printer and monitor (high-quality business television),

disk drives, telephone communications, graphics (allowing the computer to draw color pictures on the screen) and game paddles. Every expansion device snaps or plugs in, and, as with the Apple computer, you can attach your own printer, monitor or television, and disk drives.

The printer is made in Japan, the monitor in Taiwan and the drives in the U.S. Using parts from other corporations is an unusual move for IBM, but it allowed IBM to concentrate on the box behind the keyboard. This was necessary because there are so many things a well-designed personal computer can do that even IBM couldn't handle (IBM has actually offered to give technical advice to small companies wanting to design special-purpose adapters).

With the adapters already available, this computer will do just about everything I want (but I'll never be able to use IBM's Pascal unless I unplug something else). The Personal

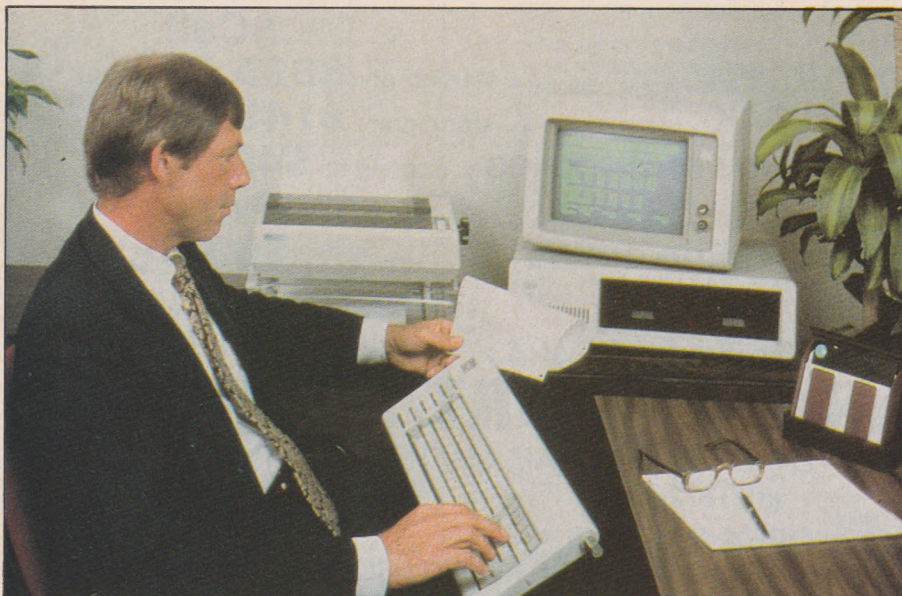
Computer is so modular that it limits itself. But that should change before a year has passed. Multipurpose boards could make several of the first adapter boards obsolete. So waiting to expand might not be a bad idea.

But as for memory, I'll have to be fair and admit that it won't be a problem when IBM finally breaks down and offers 64K-bit memory chips instead of the power-hungry, space-consuming 16K-bit chips. When they do arrive, they'll make the computer run cooler, and 256K bytes of memory won't take up precious expansion slots.

Waiting for these new chips could save more than money. They're technological marvels, using only a small percentage of the power of their predecessors. Unfortunately, they're so small that background radiation (the kind you've lived with all your life and never noticed) is enough to change bits of information. Experts say the problem has been solved, but letting others prove it first couldn't hurt.

If you wait a year or so, you may even get a refined version of these chips. IBM was rumored to have originally produced only 15,000 to test the water, and found itself flooded with orders before the first demonstrators were in place. Although this computer is ahead of others, it's way behind for IBM. First glimpses show many standard circuits from Intel, Motorola, Beckman, NEC and Texas Instruments that are bound to be replaced by fewer, more complex, circuits.

The Personal Computer could



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evolve into an extremely powerful machine. In fact, many of the parts needed for an advanced version are just now coming into volume production. IBM chose Intel's family of parts because they were the first to bring out an array of ICs that could enhance the power of the microprocessor. Each of these support chips can measurably increase the computer's speed. While every computer claims to be expandable, upgrading this one will more than triple its speed. And by the time no support chips are left to speed things up, enhanced versions of the microprocessor will arrive.

### Too Expensive

Add-on parts such as the printer live up to my expectations of IBM: expensive. IBM, like Radio Shack, took a popular printer (Epson's MX-80) and put on their own label (fortunately, IBM didn't try making this printer compatible with only their computer). When I called IBM's national marketing center, they seemed aggravated when I mentioned MX-80.

As chance would have it, I bought "IBM's" printer back in February. Epson (a division of Seiko) poured the same resources into its printer that IBM did into its Personal Computer. Epson's manual, for example, was rewritten with cartoons, sample programs and an easy-to-read style that's uncommon in technical manuals.

Epson's printers have become runaway best-sellers in the computer industry. IBM is missing a good bet by not advertising adapters such as a friction feed attachment allowing individual sheets of paper to be loaded.

If you go to an IBM Product Center (something so rare they're said to be on the endangered species list) your printer will cost \$265 more than mine. The IBM Product Centers do offer the best prices on the "IBM" printer (compared to other Personal Computer retailers) and everything else for the Personal Computer.

That "everything else" includes a direct-drive, green phosphor monitor (an expensive animal, but if you want to squint at a regular screen and save \$100 and can find one that uses a "standard" nine-pin cable, then you can shave \$100 to \$200 off the \$350 price). Disk drives are a touchy point with computer manufacturers, but this is the best place to save money. Radio Shack built in its drives and charges more than the going rate to



repair a Model III that includes other people's drives, but IBM's national marketing center claims they won't use that tactic. At a potential \$250 saving per drive, IBM may lose a lot of disk drive sales. But then, how many people buy their add-on disk drives from the Apple Computer Corporation? This is probably why IBM gave other manufacturers an easy way to adapt.

### Unadaptable?

To really use the color graphics for business (or games), you'll need a \$300 color adapter, a \$40 extended Basic disk, a \$60 game-paddle board (with its odd, 15-pin connector) and a \$325 to \$1500 color monitor. If you try using a color television with an rf modulator, you might run into problems. My TV wouldn't accept color until it had a few hours to warm up (my \$70 video game worked fine). But then, this computer was designed for professional-quality monitors (again using the nine-pin adapter, although there is a phono jack for the new direct-input televisions; RCA, Zenith, Sony, Matsushita and G.E. all introduced models this August that start at \$750 and go up fast).

The color adapter I used costs only \$29.95, isn't made by IBM and isn't fond of old color TV sets. And though it's supposed to be the best, it's the weak link in the hardware. Maybe that's why IBM refuses to make its own.

### No Games?

The lack of games bothers my girlfriend. I explain that fantastic games with incredible animated pictures are

coming (this computer uses the same Extended Color Basic as Radio Shack's Color Computer, and a few commands in this system saves hours of coding), but she remains steadfastly convinced that this can't be the perfect computer without games.

I have to admit she's right.

The TRS-80 and Apple both have hundreds of program-producing companies clamoring for attention. The programs IBM has endorsed are excellent, but besides being meager in quantity, they're offered by less than 200 computer stores, and only for business people with business budgets.

Radio Shack, Xerox and Hewlett-Packard executives were quick to point out that IBM ignored the Z-80 microprocessor with its vast library of programs. Everyone else realized the next generation of microprocessors may provide the cutting edge of technology, but it's a double-edged sword that offers a quick road to software starvation.

For any new computer, altering programs to take advantage of a better keyboard, speaker, graphics, light pen and game paddles would take months. Good programs written specifically for the IBM will probably appear a year short of the customary two years (this computer's going to attract a lot of enthusiastic programmers), but that's because IBM spent millions for versions of two industry-standard operating systems. CP/M (Control Program for Microcomputers) could help provide a flood of the best programs around Christmas.

New programs could take longer, but because of a company in Belle-



vue, WA, called Microsoft, it won't be much longer. This company is renowned for Basic interpreters. Apple calls its version Applesoft. Radio Shack calls its Level II, and Texas Instruments labeled its TI Basic. Even Atari had to give up and admit they'd better get a Microsoft version. Most of the older CP/M systems have switched to a version of Microsoft Basic called MBasic.

Farming out development of the operating system surprised everyone. It was a shrewd move that allows thousands of programs to be modified and enhanced for the IBM, with advanced disk commands that allow background music, animated graphics and the latest developments in Basic that, for the first time, allow programs to be of any size.

### Let the Beginners Beware

IBM's reference library is the best set of reference manuals I've seen (short of Radio Shack's 600-page manual for their Model II). Each subject is in a different loose-leaf binder so that adding updates will be painless.

While they're excellent reference manuals, few beginners will be able

to read through and absorb much. But, since IBM didn't try to write yet another version of Basic, a manual for the powerful color commands is already written. It's the manual for Radio Shack's Color Computer, entitled *Going Ahead with Extended Color Basic*. Although IBM has more colors, graphics pages and dots on the screen, all the commands are similar.

The rest of the Basic language can be learned from any of the dozens of books about Microsoft Basic (it's hard to find one that's not about Microsoft Basic). Although this isn't a replacement for a beginner's manual, it's a good second.

On the brighter side, the reference manuals are clearly written. And the computer is such a milestone that at least one good manual will be published by next fall, whether IBM commissions it or not.

### The Display—Fun or Business?

The Personal Computer attaches to either a monitor or color television (or, with a few days of fussing, to both at once). Of all the business systems, few have gone to the effort to include both a 25th line and characters that don't look like collections of

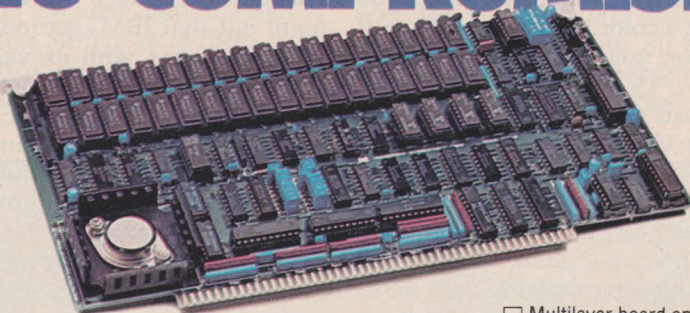
dots. The monitor (rumored to be made in Taiwan by Hitachi) is also used on the Displaywriter (IBM's word processor), but it can be replaced with one of your choosing (although IBM's direct-drive monitor has an odd, seven-pin connector). Any monitor (with the \$150 adapter) will display 255 characters in two intensities, blink them, show them as dark characters on a nice green phosphor screen, underline or even not display them depending on the color to which you set the black and white screen.

The IBM has the best color graphics system I've seen. That's due, mostly, to a really impressive feature: everything is encoded on a magnetic disk and replaceable adapter board. Thus, the graphics slot can soon hold a board with a special video microprocessor like the one NEC just introduced. When that happens, pictures with over one million dots on a screen will be available (photographic quality) and the Personal Computer will compete with the most sophisticated graphics terminals around. Combined with the fascinating new graphics language Microsoft just introduced, this should provide some

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interesting programs.

### The Keyboard?

The Personal Computer's keyboard matches the one on the IBM System 23. It's so loaded with keys that finding the Enter key while watching the screen becomes an interesting game.

Like on many new computers, the keyboard uses extra shift keys to allow each key to have a hidden personality. Ten special-function keys, for example, become 40 (although only ten are easily used) and the keypad becomes an editor for correcting what's on the screen (something that has to be seen to be believed).

The ALT shift key (short for alternate keyboard) allows fumble-fingered programmers to turn the keyboard into a shorthand pad. For example, holding down the ALT key and tapping P and U types PRINTUS-ING on the screen. (I've never been able to type that word without making a mistake.)

The reset and break keys require two hands. To reset, you tap three keys at once (hitting the reset by accident was something that constantly plagued Apple users). The break key

requires simultaneously pressing control and break.

IBM encased their keyboard in six pounds of plastic and cast iron (to keep the FCC happy by cutting down on the computer's radio frequency interference). It has the effect of making the keyboard, which looks too thin to be real, solid enough to type on without moving.

Despite the complexity of the 200 or so keys and key combinations, I'm happy with it. Not only is it well thought out, but it can be customized by any beginning programmer. I use special-function keys 7 and 9 to switch between my color television and my monitor—something that will probably be done with a switch command in a year or two.

This keyboard shows that IBM recognized what Texas Instruments didn't—the keyboard is the computer. Call it human engineering, man-machine interfacing or whatever; the more complex the keyboard, the more you can do. And after using it, you'll agree that a computer's a computer, but a computer with a keyboard this well thought out is a whole new dimension.

Including all these features in a mi-

crocomputer with game paddles, light pen and speaker will produce some unique programs. I'd like to see a word processor that used a mouse (a high-quality joystick) instead of buttons to move the cursor. An occasional "gulp" as an offending word is deleted might not be a bad feature.

Putting all of these features into the basic unit forced the base price to a lofty \$1565 (including the color adapter needed to use a color television). But surprisingly, the price comes out about the same as the Apple II when both are fully configured with upper/lowercase and 80-column displays.

In short, the display and keyboard are good enough by themselves to make sales fairly brisk. But most of the sales will come from what's in the little box behind the keyboard.

### Intel's 8088—First Of a New Generation

I imagine IBM viewed going to Intel Corp. for microprocessors much like the Pentagon would view going to Russia for rifles. But their willingness to go outside impresses me—it impresses me more than IBM setting up a software publishing department

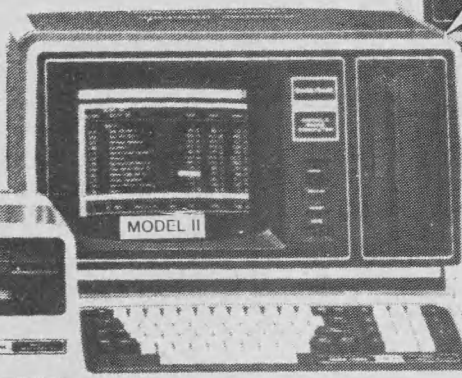
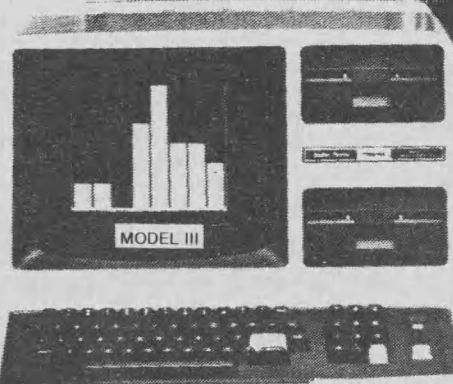
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for those wishing to publish a program through IBM, and more than publishing technical specifications that others like Radio Shack, Commodore and Atari tried so desperately (at first) to keep secret.

This move showed a willingness to do what was necessary to develop the best at a given cost. Although this tactic gives away a good slice of the profits, it's the only way any personal computer can reach its limits. This tactic is what made the Apple computer so incredibly successful and, if IBM lives up to its promises, this strategy will send competitors scrambling to survive.

### Many Microprocessors

IBM managed the colossal feat of building a computer with a new microprocessor that uses the best programs from the old microprocessors—a feat that shows up in everything from the speed of animated displays to simple sorting and high-speed math and that will become more obvious early next year when IBM offers a special math "co-microprocessor" called the 8087 (there's even an empty socket for it right next to the 8088).

Then it will show up again when another co-microprocessor, the 8089, will more than triple the speed that data flows through this computer. And again when a memory management unit with hard-disk drives makes the machine capable of doing just about everything the big computers do. (A hard disk is a faster, more dependable magnetic disk that holds much, much more than the 5¼-inch floppy disks most microcomputers use.)

Many say that Intel's 8088 microprocessor is just IBM's gimmick. While the 8088 alone isn't magical, the 8088 with all its support chips and two industry-standard operating systems is.

The 8088, in case you haven't followed microprocessors, is the "slowed down" version of Intel's 8086 microprocessor. It isn't regarded as being as powerful as Motorola's 68000, Zilog's Z8000 or National's 16000. But it's in the same ball park. Many of its support chips are in full production, and it has far outsold the other three combined. It's been thoroughly tested, and with the support of both CP/M and IBM, it'll probably become the next industry standard.

In short, unlike the computers before it, the Personal Computer will be replaced by the 8086 and use the same machine-language programs. Then, when the 8086 has reached its full life, it'll be replaced with the iAPX-286, the supercharged version that Intel just announced for delivery in 1983 (that's computer lingo for 1985). This upward expandability doesn't mean that much except when you consider machine-language programs, but they're the ones that cost so much. Normal machine-language programs have a five- to seven-year life span, but, with the ten- to 12-year life expectancy of the 8086 family of microprocessors and the expected number of sales, programs running in this computer could be unmatched in even the big machines.

### The Memory

Previously, the small amount of memory (random-access memory, working storage, or whatever) was a computer's major limitation. Every useful business program could only be a subset of one language or another because of that 64K byte limitation.

So in my enthusiasm, I got out my

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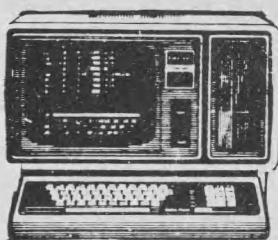
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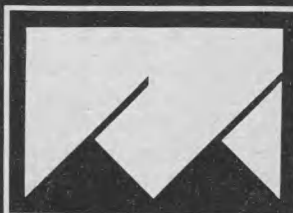
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pencil. The 8088 can address exactly 1,048,576 bytes. Of that, IBM used only 262,144 for the general memory and not quite 41,000 for the operating system's ROM (read-only memory that the computer reads when started).

This is an odd situation since the computer has a set of 16 switches that tell the computer how much memory is available. Fourteen of these switches can be repositioned to allow for that first quarter-million bytes, but the other two switches simply are not discussed. Once these are flipped, however, adding all that extra memory is simple.

Now that memory prices have tumbled, this tiny computer will soon run programs designed for the million-dollar behemoths as well as new applications such as the special version of VisiCalc that IBM contracted. That additional memory will allow advances in color graphics and use of remote terminals.

If you're only doing word processing or playing Star Trek, you'll find the standard 64K is enough. Even if you're running a business, it's unlikely you'll want much more unless you need sophisticated Pascal or Cobol

programs. But those are expensive. Too expensive, perhaps, when a thousand and one business programs are readily available for this computer with 64K bytes of memory.

### Support? Three Operating Systems!

Most people are dazzled by a new computer's features and styling. They don't realize that it takes longer to write a good operating system and support programs than it does to design the machine. This can't be emphasized enough. It's the reason IBM can move into an established field and possibly dominate it.

After Texas Instruments' new 16-bit microcomputer failed to immediately catch on, everyone was leery about going to bigger and better microprocessors. There seemed to be too many excellent programs for existing machines for a completely new personal computer to succeed.

IBM broke through this barrier with money—lots of it. They put so many programmers to work and contracted so many firms to develop versions of industry-standard programs that this "multi-million-dollar nudge" may cause some more advanced computers to fall by the way.

### Each an Industry Standard.

CP/M is the biggest operating system with the most established programs. It's a simple system that interconnects many computer languages.

UCSD Pascal is called the "language of the future." It's a more organized system than Basic and allows you to write bigger, faster-running (compiled) programs and keep them organized.

IBM's operating system with its advanced version of Microsoft Basic could become the real standard if expanded.

### The Biggest Standard?

Not only is it just \$40, but it includes a Basic with dozens of new commands (such as a music subsystem and animation). Fortunately, Microsoft is going ahead with plans to offer enhanced levels of this operating system that go all the way up to a version of Bell Lab's super operating system, Unix, normally for big computers only. This is nice because the disk operating system is so limited. I haven't found any bugs, but Radio Shack's disk operating system spoiled me.

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This sounds strange since Radio Shack hired Microsoft for six weeks to write a version of Level II Basic; IBM tied up better than a third of Microsoft's staff for over a year (after it was much larger and already had a greatly enhanced Basic). But then, writing a new Basic interpreter and writing a complete operating system for a new machine are quite different

jobs.

According to Bill Gates, president of Microsoft, of 450 IBM programmers, two dozen were specifically assigned to comb through his operating system. He claims they left it more refined than any of the company's older standards with years of field testing. The way the keyboard, array of manuals, operating system and

adapter boards all tie in makes his claim believable.

This advanced operating system offers a Basic interpreter that's a combination of Radio Shack's extended color and business Basics plus some interesting options such as modules from its own business Basic and a \$40 communications package. My only gripe is that Microsoft's new Basic

## PC Tech Manual Vital to Third-Party Vendors

One of the IBM Personal Computer's attractive features is its accessibility. The makers of the machine concluded that if others can adapt hardware peripherals and software for the Personal Computer, its market appeal can only be enhanced. So IBM has provided a Technical Reference Manual for the PC, aimed squarely at the outside vendor's market.

The IBM Technical Reference Manual carries a \$36 price tag and runs 385 pages. It's available from any authorized Personal Computer retailer or directly from IBM in Boca Raton, FL. Showing a high regard for its customers, IBM has thoughtfully provided three product comment forms at the back so that readers can comment on the manual or the Personal Computer. The Technical Reference Manual is obviously not an afterthought; IBM is out to please its customers and to assure them a valuable product.

### A Three-Part Book

The Technical Reference Manual is divided into three parts—a hardware overview, a hardware section describing the individual PC components and a ROM and system usage section. These are accompanied by an eight-page table of contents, a 21-page index, a bibliography of technical sources and five appendices.

The hardware overview is a brief, general description of the Personal Computer's configuration. In four pages, the PC's adapters, possible memory configurations and expansion options are covered.

The Personal Computer uses five expansion slots, into which a variety of peripheral adapters can be plugged. Interestingly, IBM has

developed an adapter that combines circuitry for the monochrome display and printer; but if you want color, you need an adapter for the monitor and a separate adapter for your printer. These adapters each require one of the five available expansion slots. This means a Personal Computer configured for color display will be somewhat restricted in terms of the number of peripherals that can be attached to it.

The hardware section is the meat of the manual. It contains detailed descriptions of all components: CPU motherboard, I/O buses, keyboard, cassette user interface, on-board speaker, system memory, memory-expansion switch settings, power supply specifications, the monochrome-display adapter, color-display adapter, parallel-printer adapter, the IBM dot matrix printer, ASCII coding table and control codes for the printer, disk drive adapter, game control adapter and asynchronous communications adapter. (An interesting note at the bottom of p. 70 reads, "you may lose data anytime you are running a program with the printer off and attached to the system unit.") The only question not answered is what the other 8K of ROM contains (only 40K of the 48K ROM is explained).

The ROM and system usage section contains a description of the Basic I/O System (BIOS), an interrupt vector listing, a BIOS memory map, BIOS cassette logic software algorithms, keyboard encoding numbers and tables for Basic workspace and reserved memory.

The five appendices contain an assembly listing of the ROM, an Intel 8086/8088 instruction set reference, character and keyboard

codes, logic diagrams and component electrical/environmental specifications. IBM has even included an eight-page glossary of terms.

The manual is a classic reference work; the attention to detail in producing the index, table of contents and lists of figures shows a high degree of professionalism. IBM's technical writing department knows what a technician needs in a manual. The logic diagrams are all located together in an appendix—they are not scattered throughout the text as in some manuals. This makes it easy to refer to two diagrams at the same time. Tables are placed on separate pages for quick reference, and blank pages are included throughout the manual for notes.

The manual is *not* a service manual. It does not contain printed circuit board layout diagrams, parts lists and trouble-shooting information. It is intended only for the developer of peripherals and/or software for the Personal Computer.

The manual has some problems. There are a number of typographical errors in the text; this is not acceptable in a technical manual. The most glaring deficiency is in the logic diagram schematics. Many of the schematics have been photo-reduced to fit the 5½ by 8-inch page format, thus losing some of the numbers on the diagrams. While this may not prove to be a fatal error, it will cause some technicians to reach for the aspirin bottle. A similar criticism can be made of the ROM disassembly in Appendix A; you'll need a magnifying glass to read it with accuracy. ■

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forces you to put spaces between all commands. It makes programs more readable, but sloppy people resent having neatness thrust upon them (and it'll make transferring my old programs a bit harder). The Basic's new features are taking their toll.

Many companies are transferring their programs directly to IBM's system. This can save the user several hundred dollars by not having to buy CP/M and MBasic. It also has the advantage of offering the same commands for color graphics and the light pen that aren't available with CP/M.

I expect the coming year will bring a half-dozen enhancements of IBM's system with even more features, simply because IBM's computer has so many facets.

### Care to Learn a New Language?

Pascal is the latest fad in programming languages (and it's a good one). UCSD (University of California at San Diego), the most portable version, may survive for quite a while, not just because IBM has endorsed it, but because after two years, Softech finally produced a good set of manuals.

It's simpler to write long programs in Pascal than in Basic.

Being a compiled language, Pascal requires that you write and compile an entire unit before you can run it. (UCSD is the one version that has an interpreter.) This forces you to be organized. If you want a program to do a complex, powerful job, Pascal is your language.

If you are frustrated with Basic and are willing to become a student, you'll find it well worth the effort. IBM's implementation of Pascal is well done and has a good library of programs, but for some reason it requires twice the memory of the other versions (even though the 8088 microprocessor is supposed to use memory 33 percent more efficiently). But then computerists have a saying: the more memory you have, the more you'll need.

### And Then There's the Disk

A half-dozen or so companies will soon scramble for the chance to supply a second disk drive for the Personal Computer. The home user need only attach five cables, flip a switch and slide in the second drive. Eventually, the IBM may have 25 times the capacity of the first drive if someone markets one of the new small hard-disk drives to fit in the same small

disk slot. But, IBM could make that unprofitable.

### That Something Extra

The four-second pause when the computer starts heralds something new in personal computers: a diagnostic self-test. That's as incredibly rare for microcomputers as the 48-hour replacement-by-courier service agreement. If you're in business, knowing that you'll never be without a computer for more than two days is an important feature.

Even after the computer's going, every character is checked for a parity error. Parity checking is also uncommon in personal computers.

The on-screen editor makes correcting what's on the screen unbelievably simple for self-taught typists like myself. It's already 80 percent of a word processor. After three weeks of tinkering with that editor, the special-function keys and some read-data statements, my home-built word-processing program has most of the commands of a professional one. (If you're planning on doing word processing with the IBM, send a self-addressed envelope to me and I'll send you a listing.)

But mostly, there's that 37-pin connector in the back. It's causing an awful lot of speculation. A quarter-million characters of memory coupled with a hard-disk drive will allow expansion to a multitasking, multi-user system (one person can play games while another writes a report while a third figures a payroll). Business systems using the last generation of microprocessors were limited to four simultaneous users, but this computer could address the same amount of memory as a 64-terminal Univac and do it twice as fast (the more powerful 8086 version of the microprocessor already has a multitasker available that allows 256 different tasks). The IBM Data Master provides for only two users. New chips, such as Intel's memory management unit for hard-disk drives can make a multi-user set of Personal Computers very appealing economically.

IBM has plugged the Personal Computer into both its 370/158 and Series One computers through its Asynchronous Communications package (available from IBM for \$50). This makes these computers think they're dealing with IBM's 3270 remote terminal (that's going to sell a lot of these computers). The

startling fact that IBM could, to some extent, be sacrificing one of its own products in favor of the Personal Computer and the fact that it recently introduced a "bigger brother" and a word processor called the Displaywriter (both with the 8086 versions of the same microprocessor) show that this isn't just an isolated product. There were over 100,000 of these processors sold to the general computer industry before IBM brought out this computer, and sales are increasing steadily.

### Public Reaction

Early reports from Sears and Computerland show a lot of confidence in IBM's name. Orders had matched Computerland's best-seller, Apple, before IBM had shipped its first computer or supplied more than a few demonstrators. Thousands (like me) were so impressed by the specifications that they've been buying it sight unseen. I'm no longer surprised when I visit Computerland and find all the customers huddled in the corner around the IBM or when I read yet another glowing report about it or its expansion capabilities.

Sears also seems impressed by the initial interest, but isn't sure a computer this expensive can hold its own. The high starting price hurts, but the difference in price isn't much after the dozens of accessories are added.

### Conclusion

The IBM Personal Computer isn't astounding. It doesn't do anything you can't do with an Apple. But it seems to be expandable in every direction. Apple and Atari have comparable graphics systems and Apple even has a few dozen small companies producing adapters. Radio Shack's mainstay computers have better disk operating systems and Texas Instruments has much the same sound system for much less.

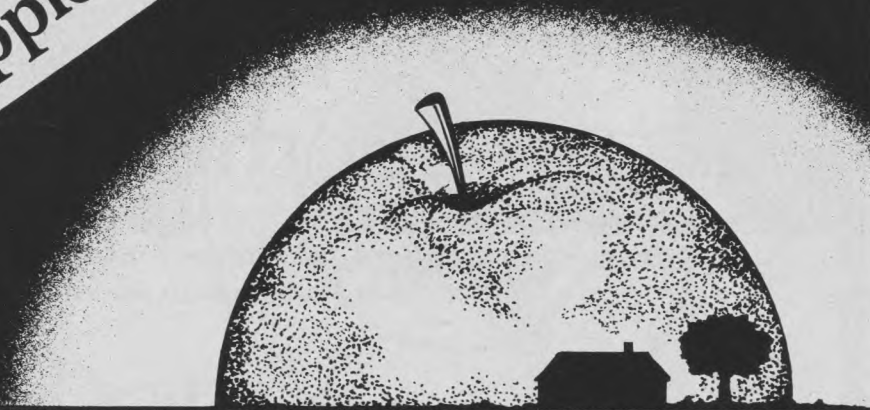
This computer seems to have three strong points:

- It has nearly every feature available on a personal computer except a speech synthesizer.
- Every feature is almost as advanced as the competition's specialty.
- Most importantly, it can be used as a business system, even though its capabilities have just begun to be exploited.

This seemingly unlimited ability to adapt and expand is what really sets the Personal Computer apart from the other small machines. ■



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# Trouble-free Cassette Use On the Atari

*If you can't yet afford disk storage for your Atari, you'd better read  
this article to learn how to use Atari cassette files.*

By Marty Carmichael

When I bought my Atari 800 computer system, I couldn't afford a disk drive. A cassette recorder was my only mass storage medium, so I was determined to make the best of it. I had to tolerate the slow speed until disk storage looked more financially plausible.

## The Problem

Minor problems occurred in writing some small programs. For instance, when I opened a data file for output with the device designation of the cassette (OPEN#1,8,0,"C:") and requested information from the screen with an input statement, the tape motor started and a header was written on the cassette as soon as the open statement executed.

A header is just a special tone to let the computer know a file is coming when the cassette is read back in. I waited for the header to be written and motor to turn off (as it does on the TRS-80 or PET); the Atari, however, is not like a TRS-80 or PET and the motor does not turn off after the header is written. So I watched as the cassette player just kept going. The problem was that the cassette motor will turn itself off only after it has written out a buffer of 128 bytes. The open statement did not write out

these 128 bytes and consequently the motor did not turn off.

## The Solutions

There are two ways to get the cassette motor to stop—manually and through system action. Turning the motor off manually has a high probability of ruining the file—useful in some applications but not this one. To turn the cassette motor off under program control, poke location 54018 with a value of 60 (type POKE 54018,60).

A better solution is to let the system take care of itself, by writing your own header of 128 bytes to the cassette. After this header is written, the motor will stop. The header can be useful if you want it to be, or it can be just a filler to get your data file going. You can put the date, the file name or anything else you like in those 128 bytes.

Listing 1 will create a data file from input given on the screen. It will then read the data file and display the information on the screen.

## Comments on Listing 1

Notice that semicolons, rather than commas, are used between variables on the print statements (PRINT#1).

Commas cause spaces to be printed to the cassette just as they will to the screen. If you put commas in the print statements, you'll get several blank spaces on your data tape—making it slower than it already is. Notice also that I used one print statement for each variable to be sent to the file. If there is more than one variable per print statement the program will not automatically separate the variables, giving you trouble when you try to read them back in. There are two ways to solve this problem.

First, use one print statement for each variable, which will automatically place a separator character between variables on the data tape. It is also simple.

Second, you can place your own character between variables. This separator character should be an end-of-line character, ATASCII code number 155. When writing more than one variable with a single print statement, just include this character between variables. For example, in Listing 1 you could change line 40 to 40 DIM HEADERS\$(128),  
NAME\$(20),ANS\$(1),SEP\$(1)  
and then add a line to set the separator character (SEP\$) to an EOL:

```
43 SEP$=CHR$(155)
```

Lines 170 and 180 could be combined into a single line

```
170 PRINT#1;NAME$;SEP$;AGE
```

You could do this with lines 230 and 240 too—the rest of the program would execute properly.

An Atari cassette file, like Atari

FLAG BYTE USED IN A DISK BOOT	(BYTE 1)	0
NUMBER OF 128 BYTE RECORDS	(BYTE 2)	1
MEMORY LOAD ADDRESS (LOW BYTE)	(BYTE 3)	2
MEMORY LOAD ADDRESS (HIGH BYTE)	(BYTE 4)	3
INITIALIZATION PROG ADDRESS (LOW)	(BYTE 5)	4
INITIALIZATION PROG ADDRESS (HIGH)	(BYTE 6)	5

Fig. 1. Boot files format.

Address correspondence to Martin Carmichael,  
143 Hollywood Ave., Tracy, CA 95376.



Basic, is not hard to use once you figure it out. But the real power of the cassette is not in the sequential data file, it's in the cassette boot file. With this little gem you can do many interesting things. The disk operating system lets you build boot files easily, but this is not true with cassette boot files. Building a cassette boot file requires more work and a basic knowledge of 6502 assembly language, but it is worth the effort if you want to do special effects.

### The Cassette Boot File

To boot a file from cassette, turn on your Atari with the start button held down and a correctly formatted file on tape. The second part of this is harder than the first. To create a boot file you must write the boot file header, and to do that you'll need to know a little about IOCBs (Input/Output Control Blocks).

### Boot File Header

The advantage of the cassette boot file is that the system will boot this whether or not you have a disk or cartridge inserted. This gives interesting abilities to read from or write to memory *before* your cartridge or disk takes over. Keep in mind that once the boot is started you take over the system—if a cartridge (or disk) needs to be executed you must jump to the correct vector yourself.

You can use Basic to create your boot files, but the assembler is easier. In either case you need to define the boot file format. Boot files have the same format whether for disk or cassette (see Fig.1). The first byte on a cassette boot file has no meaning and is used only as a flag byte for disk. The second byte is the number of 128-byte records to be read in as the boot. Bytes three and four are the load address in memory for the boot. Bytes five and six are the boot initialization address. The addresses in bytes three and four and in bytes five and six are low-byte first and high-byte second. Byte seven is the start of the boot continuation program.

The sequence of the boot process goes like this. Turn on the Atari with the start key held down. The system beeps (as usual for cassette input). Press the play button on the cassette recorder to read your boot file in. Press any key (as usual for cassette input) and the system starts reading your tape. The first 128 bytes are read and put in the cassette buffer at location 1024 (hex 0400).

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Information is extracted from the first six bytes and the record is put in memory at the address specified in bytes three and four of the header. Then the rest of the 128-byte records are read in (the number was specified in byte two of the header minus the 1 that has already been read). The system then does a jump-to-subroutine

(JSR) to your subroutine start address (bytes three and four of the header) plus 6 (this would be byte seven of your header) for the boot continuation program.

In this routine I recommend turning off the cassette motor by changing the value in PACTL at location 54018 (hex 03CA). After turning off the

```

10 REM *****
11 REM
12 REM THIS PROGRAM WILL GET INFORMATION FROM THE
13 REM SCREEN AND CREATE A SEQUENTIAL CASSETTE FILE
14 REM
15 REM AFTER IT IS CREATED THE PROGRAM WILL READ
16 REM THE FILE BACK IN. THE FILE WILL CONTAIN
17 REM THE NAMES AND AGES OF N PEOPLE.
18 REM
19 REM ***** VARIABLES *****
20 REM HEADERS$ -- THE 128 HEADER ON THE CASSETTE TAPE
21 REM NAMES$ -- A PERSONS NAME
22 REM AGE -- A PERSONS AGE
23 REM ANS$ -- A QUERY RESPONSE
24 REM
25 REM *****
40 DIM HEADERS$(128), NAMES$(20), ANS$(1)
50 REM ***** BLANK OUT HEADER *****
60 FOR I = 1 TO 128 : HEADERS$(I) = " ": NEXT I
65 REM ***** PUT IN USEFUL INFORMATION *****
70 HEADERS$(1,15) = "FILE NUMBER 1 "
80 HEADERS$(16,50) = "SEQUENTIAL FILE OF NAMES AND AGES "
85 PRINT "PRESS RECORD AND PLAY ON THE CASSETTE"
87 PRINT "WHEN YOU HEAR TWO BEEPS. THEN PRESS (RETURN)"
90 REM ***** OPEN THE FILE AND WRITE HEADER *****
100 OPEN#1,8,0,"C:"
110 PRINT#1,HEADERS$
120 REM *****
130 REM GET AND WRITE DATA
140 REM *****
150 PRINT "INPUT PERSONS NAME ":INPUT NAMES$
160 PRINT "INPUT PERSONS AGE":INPUT AGE
170 PRINT#1,NAMES$
180 PRINT#1,AGE
190 PRINT "DO YOU WISH TO CONTINUE ? (Y/N)":INPUT ANS$
200 IF ANS$<>"N" THEN GOTO 150
210 REM ***** SET EOF FLAG AND CLOSE FILE *****
220 NAMES$ = "<EOF>":AGE=0
230 PRINT#1,NAMES$
240 PRINT#1,AGE
250 CLOSE#1
260 REM *****
270 REM
280 REM THE SECOND PART WILL READ IN THE CREATED
290 REM DATA FILE
300 REM
310 REM *****
320 PRINT "REWIND THE CASSETTE AND PRESS (RETURN)"
330 PRINT "WHEN YOU HEAR THE BEEP PRESS PLAY"
335 PRINT "AND THEN PRESS (RETURN) AGAIN":INPUT ANS$
340 REM ***** OPEN THE FILE INPUT *****
350 OPEN#1,4,0,"C:"
360 REM ***** RETRIEVE OUT HEADER *****
370 INPUT#1,HEADERS$
380 REM *****
390 REM NOW READ AND WRITE UNTIL THE END OF FILE
400 REM *****
410 FOR I = 0 TO 1
420 INPUT#1,NAMES$,AGE
430 PRINT "NAME ";NAMES$;" AGE ";AGE
440 I = (NAMES$="<EOF>")
450 NEXT I
460 REM ***** CLOSE THE FILE *****
470 CLOSE #1
480 REM ***** THE PROGRAM IS DONE
490 END

```

Listing 1. Atari I/O utility.



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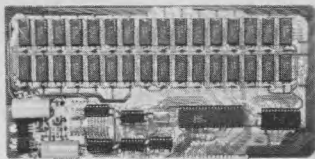
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motor, the continuation program can be any function you require.

To let the system know the boot continuation process is complete and the boot is proceeding normally, just clear the carry bit (CLC) before returning from the subroutine (RTS).

Next the system will jump-to-subroutine (JSR) for initialization of your application program. It will jump to the address in bytes five and six of the header, which have now been placed in CASINI at location 12, 13 (hex 0C,0D). Again the program can perform various functions, but you need to set DOSVEC at location 10, 11 (hex 0A,0B) before you return (RTS). This location should have the address of the application program, cartridge or disk, whichever needs to be executed after the initialization program. The system will jump (JMP) to the address specified in DOSVEC. That's how the system reads a boot file—now you have to create one.

## The IOCB

You'll need to use the IOCB blocks to perform I/O (input/output). (See Fig 2.) These are just tables or packets used to describe I/O functions. The only functions used will be the OPEN, PUT BYTE and CLOSE functions. Several other useful functions are documented in the Atari operating system user's manual. An IOCB is 16 bytes of contiguous memory. There are eight IOCBs starting at address 832 (hex 0340).

To specify a particular IOCB use the X register as an offset. Then load the IOCB and jump to the I/O routines (specifically CIOV location 58454 (hex E456)). Different information is required with different commands. In the OPEN command the IOCB points to a buffer containing

"C:" carriage return [hex 9B]

so the I/O routines will know the cassette player is being addressed.

DEVICE HANDLER I.D.	HEX (0340)
DEVICE NUMBER	(0341)
COMMAND BYTE	(0342)
STATUS	(0343)
BUFFER ADDRESS LOW	(0344)
BUFFER ADDRESS HIGH	(0345)
PUT ADDRESS LOW	(0346)
PUT ADDRESS HIGH	(0347)
BUFFER LENGTH/BYTE COUNT (LOW)	(0348)
BUFFER LENGTH/BYTE COUNT (HIGH)	(0349)
AUXILIARY INFORMATION BYTE 1	(034A)
AUXILIARY INFORMATION BYTE 2	(034B)
AUXILIARY INFORMATION BYTE 3-6	(034C-F)

Fig. 2. Input/Output Control Blocks are used to perform I/O functions.

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The direction of the I/O must also be specified (direct the I/O routines for outputting) as well as the desired inter-record gap. The PUT BYTE command tells the I/O routines where to get the data and how much to write. No extra information is needed on the close function because the command will close the IOCB that executes it.

### Comments on Listing 2

Listing 2 is essentially two programs—a program to write a boot file and an application program. The program to write a boot file starts at address \$600 (the first executable instruction is at \$61F). This will write from memory address \$0F00 for 256 bytes (two records). The boot file format and application program starts at address \$0F00. When the program at

\$61F is executed it will write out the program starting at address \$0F00. When this is complete, rewind the cassette tape and boot from the tape that has just been created—the tape will boot and automatically execute the application program.

### Conclusion

Remember two points when using Atari Basic sequential data files: write out your own header, and use semicolons rather than commas.

The Atari cassette boot file lets you run applications that cannot be created any other way. It can secure programs well enough to foil the most determined software pirate. And once the initial code is written, it is fairly easy to update for different applications. For me, it was worth the trouble. ■

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Listing 2. Atari boot file and application program.

```

10 ; *****
20 ;
30 ; THIS PROGRAM WILL CREATE A CASSETTE BOOT TAPE.
40 ; THE APPLICATION ON THE BOOT WILL CAUSE THE
50 ; BACKGROUND TO CHANGE COLOR VERY RAPIDLY
60 ;
70 ; *****
80 ;
90 ;          CONSTANTS AND EQUATES
100 OPEN  = $03          ; COMMAND TO OPEN A FILE
110 CLOSE = $0C          ; COMMAND TO CLOSE A FILE
120 PUTC  = $0B          ; COMMAND TO WRITE OUT CHARACTERS
130 STPMTR = $3C         ; COMMAND TO STOP THE CASSETTE MOTOR
140 ;
150 ICCOM = $0342        ; IO COMMAND BYTE
160 ICBAL = $0344        ; BUFFER ADDRESS (LOW BYTE)
170 ICBALH = $0345       ; BUFFER ADDRESS (HIGH BYTE)
180 ICBLL = $0348        ; BUFFER LENGTH (LOW BYTE)
190 ICBLLH = $0349       ; BUFFER LENGTH (HIGH BYTE)
200 ICAX1  = $034A        ; AUXILIARY INFORMATION BYTE 1
210 ICAX2  = $034B        ; AUXILIARY INFORMATION BYTE 2
220 ;
230 PACTL  = $D302        ; PORT CONTROL A
240 DOSVEC = $0A          ; DOS VECTOR ADDRESS
250 COLOR4 = $2C8         ; COLOR REGISTER 4 ADDRESS
255 EOL    = $9B
257 CIOV   = $E456        ; THE I/O ROUTINES ADDRESS
260 ;
270 ; *****
280 ; THE FIRST PART OF THIS WRITES THE CASSETTE
290 ; BOOT FILE. THE APPLICATION PROGRAM STARTS
300 ; AT ADDRESS $0F00. THE PROGRAM TO WRITE
310 ; THE BOOT FILE STARTS AT $61F.
300 ; *****
310 ;
320 *=$600
330 .BYTE "C:",EOL        ; FOR OPENING A CASSETTE FILE
340 CFILE .WORD $600      ;
360 *=$61F
370 CBOOT
380 LDX #10                ; LOAD OFFSET TO USE IOCB 1
390 ; SET IOCB #1 FOR OPENING
400 ;
410 LDA #OPEN              ; LOAD OPEN COMMAND
420 STA #ICCOM,X           ; PUT IN COMMAND BYTE IOCB 1
430 LDA #$08              ; SET UP AS AN OUTPUT FILE
440 STA ICAX1,X            ; PUT IN AS AUXILIARY INFO
450 LDA #$80              ; SELECT SHORT INTER REC GAP

```

More



## Listing 2 continued.

```

460 STA ICAX2,X      ; STORE IN SECOND AUX INFORMATION
470 LDA CFILE        ; LOAD LOW BYTE OF ADDRS OF "C:"
480 STA ICBAL,X      ; PUT IN AS BUFFER ADDRS LOW BYTE
490 LDA CFILE+1      ; GET HIGH BYTE OF ADDRS OF "C:"
500 STA ICBAL,X      ; PUT IN AS HIGH BYTE IN BUF ADDRS
510 ; JUMP TO IO ROUTINE
520 JSR CIOV         ; OPEN FILE OUTPUT
530 BMI ERR          ; ERROR
540 ; NEXT WE WILL WRITE OUR APPLICATION PROGRAM OUT
550 LDA #PUTCHR      ; LOAD COMMAND FOR PUT CHARACTERS
560 STA ICCOM,X      ; PUT IN AS COMMAND IN IOCB
570 LDA #$80         ; LOAD LENGTH OF 128 BYTES
580 STA ICBLL,X      ; PUT IN BUFFER LENGTH LOW
590 LDA #0           ; ZERO OUT BUFFER LENGTH HIGH
593 STA ICBLLH,X     ; ZERO OUT BUFFER LENGTH HIGH
595 STA ICBAL,X      ; ZERO OUT BUFFER ADDRESS LOW
597 LDA #$0F         ; APPLICATION START ADDRESS IS $0F00
599 STA ICBAL,X      ; PUT IN BUFFER ADDRESS HIGH
600 ; JUMP TO IO ROUTINE AND WRITE THE FILE
610 JSR CIOV         ;
620 BMI ERR          ; ERROR
630 ; NOW CLOSE THE FILE
640 LDA #CLOSE       ; LOAD CLOSE COMMAND
650 STA ICCOM,X      ; PUT IN AS COMMAND BYTE IN IOCB 1
660 ; JUMP TO IO ROUTINE AND CLOSE THE FILE
665 JSR CIOV         ;
670 BMI ERR          ; ERROR
675 BRK              ; STOP PROGRAM
680 ; ERROR JUST MEANS STOP. THE DEBUGGER WILL
690 ; DISPLAY ALL THE REGISTERS SO YOU CAN
700 ; TELL AN ERROR FROM A REGULAR STOP
710 ERR
720 BRK              ; STOP THE PROGRAM
730
740 ;*****
750 ; THIS IS THE APPLICATION PART OF THE PROGRAM
760 ; A SMALL ROUTINE THAT CHANGES THE BACKGROUND
770 ; ACTUALLY ANY APPLICATION CAN GO HERE
780 ;*****
790
800 *=$0F00
810 .BYTE 0           ; FIRST BYTE OF BOOT HEADER
820 .BYTE 2           ; READ 2 128 BYTE RECORDS
830 .WORD $0F00       ; WHEN RELOADING LOAD TO $0F00
840 .WORD $0F80       ; INITIALIZATION STARTS AT $0F80
850 ; NOW THE BOOT CONTINUATION PROGRAM
860 LDA #STPMTR       ; LOAD BITS TO STOP CASSETTE MOTOR
870 STA PACTL        ; PUT IN PORT CONTROL A
880 ;
890 ; PUT YOUR OWN STUFF HERE
900 ;
910 CLC               ; CLEAR CARRY BIT TO SHOW GOOD RETURN
920 RTS               ; RETURN FROM SUBROUTINE
930 *=$0F80           ; INITIALIZATION
940 ;*****
950 ; THE INITIALIZATION PROGRAM WILL PLACE THE APPLICATION
960 ; STARTING ADDRESS INTO DOSVEC (0A,0B). THE
APPLICATION
970 ; STARTING ADDRESS IS $0FA0
980 ;*****
990 LDA #SA0          ; LOAD LOW BYTE OF ADDRESS FIRST
1000 STA DOSVEC       ; PUT IN DOSVEC
1010 LDA #$0F         ; LOAD HIGH BYTE AND PUT IN DOSVEC +1
1020 STA DOSVEC+1     ;
1030 ; NOW RETURN FROM SUBROUTINE AND JUMP TO DOSVEC
1040 RTS
1050 ;*****
1060 ; THE APPLICATION PROGRAM
1070 ;*****
1080 ;
1090 *=$0FA0
1100 APPROG
1110 LDA #0            ; REG A WILL CYCLE THROUGH THE
1120 CNGCLR            ; COLOR 4 REGISTER WHICH WILL CHANGE
1130 CLC               <THE BACKGROUND COLORS
1140 ADC #1            ; ADD ONE TO GET NEXT COLOR
1150 STA COLOR4       ; PUT A IN THE COLOR REGISTER
1160 JMP CNGCLR       ; CYCLE BACK TO CHANGE COLOR
1170 ;
1180 .END

```

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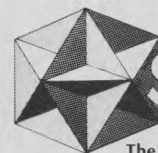
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2 (APR 1984)	12,100.00	9075.00	21.00 %
3 (APR 1985)	13,310.00	9982.50	33.10 %
4 (APR 1986)	14,641.00	10,980.75	46.41 %
5 (APR 1987)	16,105.10	12,078.83	61.05 %
6 (APR 1988)	17,715.61	13,286.71	77.16 %
7 (APR 1989)	19,487.17	14,615.38	94.87 %
8 (APR 1990)	21,435.89	16,076.92	114.36 %
9 (APR 1991)	23,579.48	17,684.61	135.79 %
10 (APR 1992)	25,937.42	19,453.07	159.37 %
11 (APR 1993)	28,531.17	21,398.38	185.31 %
12 (APR 1994)	31,384.28	23,538.21	213.84 %
13 (APR 1995)	34,522.71	25,892.03	245.23 %
14 (APR 1996)	37,974.98	28,481.24	279.75 %
15 (APR 1997)	41,772.48	31,329.36	317.72 %
16 (APR 1998)	45,949.73	34,462.30	359.50 %
17 (APR 1999)	50,544.70	37,908.52	405.45 %
18 (APR 2000)	55,599.17	41,699.38	455.99 %
19 (APR 2001)	61,159.09	45,869.32	511.59 %
20 (APR 2002)	67,275.00	50,456.25	572.75 %

\*\*\*\*\*

Sample run. Estimated schedule. Starting value \$10,000. Estimated rate of appreciation 10 percent.

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for 5 1/4" North Star CP/M (single density)  
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as a column showing a 75 percent loan value, or about what you might be able to borrow on the investment—something to give you an indication of another source of cash as the investment grows in value.

Once you get a hard copy, the program automatically stops. Until then you can revise the data on the screen as much as you want to.

### From a Programming Standpoint

Appreciation consists of five major areas.

Lines 10-345 set up the three arrays that are used, input all the data and handle the math involved.

Lines 350-495 provide the user with a display of the data and let you correct or change any of it; this section also allows you to ask for a display of the results based on your data, and/or a hard copy.

Lines 500-920 are the printing section. Lines 560-570 access the printer; you may have to adjust these lines to accept your own printer.

Lines 15000-16020 make up the print-using section. In this section numbers go in as the variable Z9 and come out as the string Z9\$.

Finally, lines 17000-18010 comprise the display section of the program and show you the results of your investment data.

Appreciation uses three single-dimension arrays: A, which will be the value of your investment each year; B, which is the 75 percent loan value of that investment (used only on the hard copy printout); and I, which is the cumulative percentage increase.

Here's a list of the main variables:

A\$—the description of the investment  
M1\$—miscellaneous information #1  
M2\$—miscellaneous information #2  
Y—year you made your investment  
N\$—month you made the investment  
V—the starting value  
P—the estimated rate in percent of appreciation  
Z9—the variable used to add zeros in the right place for the print-using routine  
Z9\$—the print-using value as a string  
X—used as a counter  
Q—used to answer program questions  
C—used as a counter in the arrays

So use Appreciation to compare one investment with another; see what will happen to your dollars at various rates of appreciation; marvel at the effects of compounding your investment.

Ever wonder what happens to those dollars as inflation deflates them? This program will show you.

Be sure to keep those printouts handy so that you can "appreciate" your investments! ■

### Program listing. Appreciation program for the Apple II Plus.

```

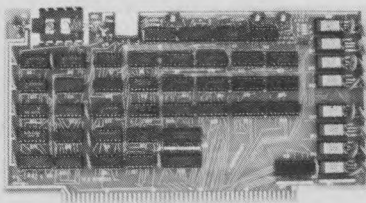
10 DIM A(25): DIM B(25): DIM I(25)
100 HOME
105 PRINT
108 FOR X = 1 TO 5: GOSUB 11000: NEXT
126 PRINT
130 PRINT "<1> ENTER, DISPLAY AND/OR PRINT DATA."
135 PRINT
137 PRINT "<2> STOP NOW."
139 PRINT
140 GOSUB 11000
145 PRINT
150 PRINT
160 INPUT "PLEASE SELECT----->":Q
170 IF Q = 1 THEN 200
180 IF Q = 2 THEN PRINT "END OF PROGRAM": END
190 GOTO 100
200 HOME: PRINT
205 PRINT: GOSUB 11000: PRINT: PRINT
210 PRINT "DESCRIPTION OF THE ITEM ? "
212 PRINT: INPUT A$
215 PRINT: PRINT: GOSUB 11000: PRINT: PRINT
217 PRINT "MISC. INFORMATION IS ANY DATA YOU'D"
219 PRINT "LIKE PRINTED ON YOUR HARD COPY, SUCH"
220 PRINT "AS LOAN INFO, DATE OF PURCHASE, ETC."
222 PRINT: PRINT: INPUT "MISC. INFO <A> ":M1$
225 PRINT
230 INPUT "MISC. INFO <B> ":M2$
232 HOME: PRINT: GOSUB 11000: PRINT: PRINT
235 PRINT: INPUT "THIS YEAR (1982, ETC.) ":Y
237 HOME: PRINT: PRINT: GOSUB 11000
238 PRINT: PRINT: PRINT
240 PRINT "PLEASE INPUT THE MONTH IN WHICH"
246 PRINT "YOU BOUGHT THIS PROPERTY -- "
247 PRINT "3 LETTERS, PLEASE:": PRINT: PRINT "JAN...FEB...MAR...APR...MA
Y...JUN"
248 PRINT "JUL...AUG...SEP...OCT...NOV...DEC"
249 PRINT: PRINT: INPUT N$: IF LEN (N$) > 3 THEN 237
250 HOME: PRINT: PRINT: GOSUB 11000: PRINT: PRINT
255 PRINT "PLEASE INPUT THE STARTING VALUE OF THE"
256 PRINT "PROPERTY -- WHAT YOU PAID FOR IT, OR"

```

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## Super Compuprism Color Graphics



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(32K Memory 288H. x 192V.)

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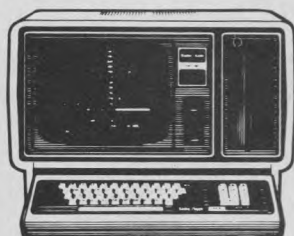


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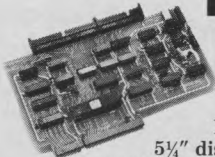
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*Listing continued.*

```

257 PRINT "WHAT YOU PLAN TO SPEND ON IT."
258 PRINT : INPUT "AMOUNT " : V
259 IF V < 1 THEN 250
260 HOME : PRINT : PRINT : GOSUB 11000 : PRINT : PRINT
265 PRINT "PLEASE ANSWER WHAT YOU THINK THE RATE"
267 PRINT "OF " : INVERSE : PRINT "APPRECIATION " : NORMAL : PRINT "WILL
    BE:"
268 PRINT : PRINT
270 PRINT "PLEASE ANSWER .10 FOR 10%, .05 FOR 5%,"
272 PRINT ".12 FOR 12%, AND SO ON." : PRINT
275 PRINT
276 PRINT "(YOU CAN ANSWER WITH A MINUS FIGURE,"
277 PRINT "IF YOU THINK THE VALUE WILL DECREASE"
278 PRINT "...LIKE -.05 OR -.12, ETC.)." : PRINT : PRINT
280 PRINT : INPUT "EST % OF APPRECIATION " : P
282 IF P > 1 THEN 280
285 GOSUB 290
288 GOTO 350
290 P = P + 1
300 REM DO MATH
310 A(0) = V
320 FOR C = 1 TO 20
330 A(C) = A(C - 1) * P
340 NEXT C
342 P = P - 1
345 RETURN
350 HOME
360 GOSUB 11000 : PRINT
370 PRINT "<1> " : A$
372 PRINT "<2> " : M1$
374 PRINT "<3> " : M2$
376 PRINT "<4> " : Y$ : (YEAR PURCHASED)
378 PRINT "<5> " : N$ : (MONTH PURCHASED)
380 PRINT
382 PRINT "<6> " : V$ : (STARTING VALUE)
383 PRINT "<7> " : INT ((P) * 10 ^ 2 + .5) / 100 : (EST RATE OF APPRECIATI
    ON)
386 PRINT
387 GOSUB 11000 : PRINT
388 PRINT "TO CHANGE THE DATA, ANSWER THE"
390 PRINT "PROPER NUMBER FROM THE LIST ABOVE." : PRINT
391 PRINT "TO DISPLAY THE RESULTS, ANSWER 8."
392 PRINT "TO PRINT THE RESULTS, ANSWER 9."
393 PRINT : PRINT "TO STOP NOW, ANSWER 0."
394 PRINT : INPUT "PLEASE SELECT-----" : Q
395 IF Q < 0 THEN 350
396 IF Q = 0 THEN PRINT "END OF PROGRAM" : END
397 IF Q > 9 THEN 350
398 ON Q GOTO 420, 430, 440, 450, 460, 470, 480, 490, 500
420 INPUT "CORRECT DESCRIPTION " : A$
425 GOTO 350
430 INPUT "CORRECT MISC. INFO " : M1$
435 GOTO 350
440 INPUT "CORRECT MISC. INFO " : M2$
445 GOTO 350
450 INPUT "CORRECT YEAR " : Y
455 GOTO 350
460 PRINT "CORRECT MONTH...."
462 INPUT "(3 LETTERS, PLEASE) " : N$
463 IF LEN(N$) > 3 THEN 460
465 GOTO 350
470 INPUT "CORRECT STARTING VALUE " : V
471 IF V < 1 THEN 470
472 GOSUB 290 : REM TO RE-DO MATH BASED ON NEW DATA
475 GOTO 350
480 PRINT "CORRECT ESTIMATED PERCENT OF "
482 INPUT "APPRECIATION " : P
483 IF P > 1 THEN 482
484 GOSUB 290 : REM TO RE-DO MATH BASED ON NEW DATA
485 GOTO 350
490 GOSUB 17000 : REM DISPLAY
495 GOTO 350
500 HOME : PRINT
505 GOSUB 11000 : PRINT
510 FLASH : PRINT "TURN ON THE PRINTER" : NORMAL : PRINT
520 PRINT "ANSWER 1 TO START PRINTING..."
525 PRINT "...2 TO EXIT NOW..."
530 PRINT
540 INPUT Q
545 IF Q = 1 THEN 550
547 GOTO 350
550 D$ = CHR$(4)
560 PRINT D$ : "PR#1"
570 PRINT ""
575 PRINT ""
576 FOR CO = 1 TO 1000 : NEXT CO
580 PRINT TAB(10) "ESTIMATED APPRECIATION SCHEDULE"
582 PRINT " " : PRINT TAB(10) "PREPARED FOR " : A$
583 PRINT TAB(10) M1$
584 PRINT TAB(10) M2$
585 PRINT TAB(10) "STARTING VALUE " :
586 Z9 = V : GOSUB 15000
587 PRINT Z9$
588 PRINT TAB(10) "ESTIMATED RATE OF APPRECIATION " :
589 Z9 = 100 * P : GOSUB 15000
590 PRINT Z9$ : " %"
595 PRINT " "
596 PRINT "*****"
597 PRINT " "
600 PRINT TAB(10) "YEAR" :
610 PRINT TAB(10) "VALUE" :
620 PRINT TAB(6) "75% LOAN AMT" :
630 PRINT TAB(4) "% INCREASE"

```

More →



Listing continued.

```

640 PRINT "
700 FOR C = 1 TO 20
705 A(C) = INT (A(C) * 10 ^ 2 + .5) / 100
710 Z9 = A(C): GOSUB 15000
720 PRINT TAB( 5):C;
722 PRINT " (":N$:" "
723 PRINT C + Y;
724 PRINT "):";
730 C$ = STR$ (C)
740 O8 = LEN (C$)
750 O9 = LEN (Z9$)
760 PRINT TAB( 20 - O9 - O8)Z9$;
770 REM B IS 75% LOAN VALUE
780 B(C) = A(C) * .75
790 Z9 = B(C): GOSUB 15000
800 O9 = LEN (Z9$)
810 PRINT TAB( 15 - O9)Z9$;
820 REM I(C) = % INCREASE OVER ORIGINAL AMOUNT
830 I(C) = (A(C) - V) / V
835 I(C) = I(C) * 100: REM SO DECIMAL WILL BE RIGHT
840 Z9 = I(C): GOSUB 15000
850 O9 = LEN (Z9$)
860 PRINT TAB( 15 - O9)Z9$;" %"
870 PRINT "
875 FOR CO = 1 TO 500: NEXT
880 NEXT C
885 PRINT "*****
      *****"
890 D$ = CHR$ (4)
900 PRINT D$:"PR#0"
910 PRINT "END OF PROGRAM....."
920 END

11000 INVERSE : PRINT TAB( 15)"APPRECIATION      ": NORMAL
11010 RETURN
15000 REM *****
15001 REM THIS PRINTING ROUTINE IS BASED
15002 REM ON A PROGRAM BY MICHAEL DONAHUE
15003 REM PUBLISHED IN MICROCOMPUTING MAGAZINE
15004 REM IN NOVEMBER 1979
15005 REM *****
15008 IF Z9 < 0 THEN 16000
15010 REM Z9= VARIABLE TO BE CHANGED
15020 IF (100 * Z9 - INT (100 * Z9)) < .5 THEN Z9 = INT (100 * Z9) / 10
      O: GOTO 15030
15022 Z9 = ( INT (100 * Z9) + 1) / 100
15024 REM MOVE ALPHANUMERIC TO STRING VARIABLE
15030 Z9$ = STR$ (Z9)
15035 REM ADD DOLLAR SIGN
15045 REM ADJUST DECIMAL IF REQUIRED
15050 Z9 = LEN (Z9$): IF Z9 < = 2 THEN 15200
15055 Y9$ = RIGHT$ (Z9$,3)
15060 IF Y9$ < = "$99" THEN 15080
15070 IF Y9$ < = ".99" THEN 15220
15080 Y9$ = RIGHT$ (Z9$,2)
15090 IF Y9$ < = ".9" THEN Z9$ = Z9$ + "0": GOTO 15210
15200 Z9$ = Z9$ + ".00"
15205 REM NOW TO ADD A COMMA, IF REQUIRED
15210 Z9 = LEN (Z9$)
15220 IF Z9 < 8 THEN 15400
15230 Y9$ = RIGHT$ (Z9$,6)
15240 Y9$ = "." + Y9$
15250 Y9$ = LEFT$ (Z9$, (Z9 - 6)) + Y9$
15255 REM Z9$ IS THE EDITED FIELD
15260 Z9$ = Y9$
15262 IF LEN (Z9$) > 10 THEN 15500
15265 REM Z9 WILL CONTAIN THE LENGTH OF THE EDITED FIELD
15267 Z9 = Z9 + 1
15400 RETURN
15500 REM TO ADD A COMMA FOR MILLIONS
15505 Z9 = LEN (Z9$)
15510 Y9$ = RIGHT$ (Z9$,10)
15520 Y9$ = "." + Y9$
15530 Y9$ = LEFT$ (Z9$, (Z9 - 10)) + Y9$
15535 Z9$ = Y9$
15540 GOTO 15267
16000 Z9$ = STR$ (Z9)
16010 REM
16020 RETURN
16050 Z9$ = STR$ (Z9): RETURN
17000 HOME : REM DISPLAY SECTION
17010 PRINT "MONTH/YEAR","VALUE      CUM % INCREASE"
17020 GOSUB 18000
17030 FOR C = 1 TO 20
17035 PRINT N$:" "
17040 PRINT C + Y;
17042 V$ = STR$ (C + Y)
17043 O8 = LEN (V$)
17050 Z9 = A(C): GOSUB 15000
17055 O9 = LEN (Z9$)
17060 PRINT TAB( 27 - O8 - O9)Z9$;
17065 O8 = LEN (Z9$)
17070 I(C) = (A(C) - V) / V
17080 I(C) = I(C) * 100: REM SO DECIMAL WILL BE RIGHT
17090 Z9 = I(C): GOSUB 15000
17100 O9 = LEN (Z9$)
17110 PRINT SPC( 16 - O9)Z9$
17200 NEXT C
17210 GOSUB 18000
17300 PRINT "HIT ANY KEY TO CONTINUE....": GET W$
17310 RETURN
18000 FOR X = 1 TO 40: PRINT "-": NEXT
18010 RETURN

```

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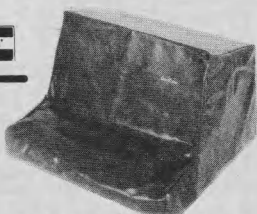
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## Listing 1 continued from page 96

```

1090 IF Z$="F+F+F+F+" OR Z$="F-F-F-F-" THEN 1390
1100 IF Z$="Y+Y+Y+Y+" OR Z$="Y-Y-Y-Y-" THEN 1390
1110 IF Z$="C+C+C+C+" OR Z$="C-C-C-C-" THEN 1390
1120 IF Z$="B-B-B-B-" THEN 1390
1130 W=6 : Z$=MID$(A$,K,W)
1140 IF Z$="C+C+C+" THEN W$="C-" : GOTO 1400
1150 IF Z$="C-C-C-" THEN W$="C+" : GOTO 1400
1160 IF Z$="F+F+F+" THEN W$="F-" : GOTO 1400
1170 IF Z$="F-F-F-" THEN W$="F+" : GOTO 1400
1180 IF Z$="Y+Y+Y+" THEN W$="Y-" : GOTO 1400
1190 IF Z$="Y-Y-Y-" THEN W$="Y+" : GOTO 1400
1200 IF Z$="B-B-B-" THEN W$="B+" : GOTO 1400
1210 W=4 : Z$=MID$(A$,K,W)
1220 IF Z$="C2C2" OR Z$="F2F2" OR Z$="Y2Y2" THEN 1390
1230 IF Z$="F+F-" OR Z$="F-F+" OR Z$="Y+Y-" THEN 1390
1240 IF Z$="Y-Y+" OR Z$="C-C+" OR Z$="C+C-" THEN 1390
1250 IF Z$="F+F+" OR Z$="F-F-" THEN W$="F2" : GOTO 1400
1260 IF Z$="Y+Y+" OR Z$="Y-Y-" THEN W$="Y2" : GOTO 1400
1270 IF Z$="C+C+" OR Z$="C-C-" THEN W$="C2" : GOTO 1400
1280 IF Z$="C2C+" OR Z$="C+C2" THEN W$="C-" : GOTO 1400
1290 IF Z$="C2C-" OR Z$="C-C2" THEN W$="C+" : GOTO 1400
1300 IF Z$="B-B-" THEN W$="B2" : GOTO 1400
1310 NEXT K
1320 REM PRINT SOLUTION
1330 IF A$="" THEN RETURN
1340 FOR J=1 TO LEN(A$) STEP 2
1350 PRINT MID$(A$,J,2) ; " "
1360 IF POS(K)>=31 THEN PRINT
1370 NEXT J : PRINT : A$="" : RETURN
1380 REM BUILD REDUCED ANSWER STRING
1390 W$=""
1400 IF K>1 THEN B$=LEFT$(A$,K-1)
1410 B=LEN(A$)-K-W+1 : IF B>0 THEN C$=RIGHT$(A$,B)
1420 A$=B$+W$+C$
1430 GOTO 1050
1440 REM ENTER CUBIE COLORS
1450 K$="FRONT TOP BACK BOTTOM RIGHT LEFT "
1460 FOR B=1 TO 6
1470 PRINT MID$(K$,7*B-6,7) ; : INPUT S$(B)
1480 IF S$(B)="X" THEN 1500
1490 IF LEN(S$(B))<>9 THEN PRINT "ERROR! LENGTH NOT 9" : GOTO 1470
1500 NEXT B
1510 W=0 : FOR Y=1 TO 3 : FOR X=1 TO 3 : W=W+1
1520 IF S$(1)<>"X" THEN F(X,Y)=ASC(MID$(S$(1),W,1))
1530 IF S$(2)<>"X" THEN U(X,Y)=ASC(MID$(S$(2),W,1))
1540 IF S$(3)<>"X" THEN B(X,Y)=ASC(MID$(S$(3),W,1))
1550 IF S$(4)<>"X" THEN D(X,Y)=ASC(MID$(S$(4),W,1))
1560 IF S$(5)<>"X" THEN R(X,Y)=ASC(MID$(S$(5),W,1))
1565 IF S$(6)<>"X" THEN L(X,Y)=ASC(MID$(S$(6),W,1))
1570 NEXT X : NEXT Y : GOSUB 1580 : RETURN
1580 J=0 : REM CHECKSUM TEST
1590 FOR X=1 TO 3 : FOR Y=1 TO 3
1600 K=F(X,Y)+U(X,Y)+B(X,Y)+D(X,Y)+L(X,Y)+R(X,Y)
1610 J=J+K : NEXT Y : NEXT X
1620 K=F(2,2)+U(2,2)+B(2,2)+D(2,2)+L(2,2)+R(2,2)
1630 IF J=K*9 THEN RETURN
1640 PRINT "CHECKSUM ERROR!":EE=1:RETURN
1650 REM
1660 REM DRAW CUBE
1670 PRINT
1680 FOR Y=1 TO 3 : J=4-Y
1690 PRINT TAB(18) ; "!" ; CHR$(U(1,J)) ; " " ; CHR$(U(2,J)) ; " " ;
1700 PRINT CHR$(U(3,J)) ; " !" : NEXT Y
1710 PRINT TAB(11) ; "-----+-----+-----"
1720 FOR Y=1 TO 3 : J=4-Y
1730 PRINT TAB(10) ; "!" ; CHR$(L(1,J)) ; " " ; CHR$(L(2,J)) ;
1740 PRINT " " ; CHR$(L(3,J)) ; " !" ;
1750 PRINT CHR$(F(1,J)) ; " " ; CHR$(F(2,J)) ; " " ; CHR$(F(3,J)) ; " !" ;
1760 PRINT CHR$(R(3,Y)) ; " " ; CHR$(R(2,Y)) ; " " ; CHR$(R(1,Y)) ; " !" ;
1770 PRINT TAB(38) ; "!" ; CHR$(B(1,Y)) ; " " ; CHR$(B(2,Y)) ;
1780 PRINT " " ; CHR$(B(3,Y)) ; " !" : NEXT Y
1790 PRINT TAB(11) ; "-----+-----+-----"
1800 FOR Y=1 TO 3 : J=4-Y
1810 PRINT TAB(18) ; "!" ; CHR$(D(1,J)) ; " " ; CHR$(D(2,J)) ;
1820 PRINT " " ; CHR$(D(3,J)) ; " !" : NEXT Y : PRINT : RETURN
1830 REM
1840 REM FIX L FOR CCW TURN
1850 IF L=3 THEN L=1:GOTO 1870
1860 IF L=1 THEN L=3
1870 W=W+1 : RETURN
1880 REM GET DATA FOR FACE TURNS
1890 RESTORE
1900 FOR J=1 TO 11 : READ G$,R,L
1910 IF G$=Q$ THEN RETURN
1920 NEXT J
1930 PRINT :PRINT TAB(W-1) ; "^ ERROR":EE=1:RETURN:
1940 DATA R,3,1,F,4,1,L,1,3,B,6,3,U,9,3,D,7,1
1950 DATA X,2,1,Z,8,1,Y,5,1,C,5,1,O,0,0
1960 REM ROTATE WHOLE CUBE
1970 IF G$="X" THEN W9=1 : GOTO 2020
1980 IF G$="Y" THEN W9=4 : GOTO 2020
1990 IF G$="C" THEN W9=4 : GOTO 2020
2000 IF G$="Z" THEN W9=7 : GOTO 2020
2010 GOTO 1930
2020 FOR R=W9 TO W9+2 : GOSUB 2390

```

More



Listing 1 continued.

```

2030 IF L1=1 THEN GOSUB 2390 : GOSUB 2390
2040 NEXT R : W=W+1 : RETURN
2050 REM FACE MOVE ROUTINES
2060 FOR Y=1 TO 2 : J=4-Y
2070 W(1,J)=F(1,J) : F(1,J)=F(Y,1)
2080 F(Y,1)=F(3,Y) : F(3,Y)=F(J,3)
2090 F(J,3)=W(1,J) : NEXT Y
2100 RETURN
2110 FOR Y=1 TO 2 : J=4-Y
2120 W(3,J)=U(3,J) : U(3,J)=U(J,1)
2130 U(J,1)=U(1,Y) : U(1,Y)=U(Y,3)
2140 U(Y,3)=W(3,J) : NEXT Y
2150 RETURN
2160 FOR Y=1 TO 2 : J=4-Y
2170 W(Y,3)=B(Y,3) : B(Y,3)=B(3,J)
2180 B(3,J)=B(J,1) : B(J,1)=B(1,Y)
2190 B(1,Y)=W(Y,3) : NEXT Y
2200 RETURN
2210 FOR Y=1 TO 2 : J=4-Y
2220 W(1,J)=D(1,J) : D(1,J)=D(Y,1)
2230 D(Y,1)=D(3,Y) : D(3,Y)=D(J,3)
2240 D(J,3)=W(1,J) : NEXT Y
2250 RETURN
2260 FOR Y=1 TO 2 : J=4-Y
2270 W(1,Y)=L(1,Y) : L(1,Y)=L(Y,3)
2280 L(Y,3)=L(3,J) : L(3,J)=L(J,1)
2290 L(J,1)=W(1,Y) : NEXT Y
2300 RETURN
2310 FOR Y=1 TO 2 : J=4-Y
2320 W(1,J)=R(1,J) : R(1,J)=R(Y,1)
2330 R(Y,1)=R(3,Y) : R(3,Y)=R(J,3)
2340 R(J,3)=W(1,J) : NEXT Y
2350 RETURN
2360 REM RELATION BETWEEN 'R' AND MOVES
2370 REM 1 L-,2 X+,3 R+,4 F+,5 Y+,6 B-
2380 REM 7 D+,8 Z+, AND 9 U-
2390 REM ROTATE R=1 THRU 9
2400 IF R > 3 THEN 2490
2410 FOR Y=1 TO 3
2420 W(R,Y)=D(R,Y) : D(R,Y)=B(R,Y)
2430 B(R,Y)=U(R,Y) : U(R,Y)=F(R,Y)
2440 F(R,Y)=W(R,Y) : NEXT Y
2450 IF R=1 THEN 2260
2460 IF R=3 THEN 2310
2470 RETURN
2480 REM
2490 REM R 4 THRU 6
2500 IF R > 6 THEN 2600
2510 J=7-R
2520 FOR Y=1 TO 3 : W(4-Y,J)=D(4-Y,J)
2530 D(4-Y,J)=R(J,Y) : R(J,Y)=U(Y,4-J)
2540 U(Y,4-J)=L(J,Y) : L(J,Y)=W(4-Y,J)
2550 NEXT Y
2560 IF R=4 THEN 2050
2570 IF R=6 THEN 2160
2580 RETURN
2590 REM
2600 REM R=7 THRU 7
2610 J=10-R
2620 FOR X=1 TO 3 : W(X,4-J)=L(X,4-J)
2630 L(X,4-J)=B(4-X,J) : B(4-X,J)=R(4-X,J)
2640 R(4-X,J)=F(X,4-J) : F(X,4-J)=W(X,4-J)
2650 NEXT X
2660 IF R=7 THEN 2210
2670 IF R=9 THEN 2110
2680 RETURN
2690 REM
2700 REM PUT FRONT CORNER CUBIES IN PLACE
2710 GOTO 2870
2720 B5=0
2730 IF L(3,3)=L(2,2) THEN B5=B5+1
2740 IF L(3,3)=U(2,2) THEN B5=B5+1
2750 IF F(1,3)=L(2,2) THEN B5=B5+1
2760 IF F(1,3)=U(2,2) THEN B5=B5+1
2770 IF U(1,1)=L(2,2) THEN B5=B5+1
2780 IF U(1,1)=U(2,2) THEN B5=B5+1
2790 IF R(3,1)=U(2,2) THEN B5=B5+1
2800 IF R(3,1)=R(2,2) THEN B5=B5+1
2810 IF U(3,1)=U(2,2) THEN B5=B5+1
2820 IF U(3,1)=R(2,2) THEN B5=B5+1
2830 IF F(3,3)=U(2,2) THEN B5=B5+1
2840 IF F(3,3)=R(2,2) THEN B5=B5+1
2850 RETURN
2860 REM
2870 B4=0
2880 GOSUB 2720
2890 B4=B4+1 : IF B4=4 THEN 2980
2900 IF B5<4 THEN Z$="F+" : GOSUB 520 : GOTO 2880
2910 Z$="C+C+" : GOSUB 520 : GOSUB 2720
2920 IF B5<4 THEN 2970
2930 Z$="C2" : GOSUB 520
2940 GOSUB 1040
2950 PRINT "FRONT FACE CORNER CUBIES IN CORRECT CUBICLES"
2960 RETURN
2970 Z$="C+C+P8" : GOSUB 520 : GOTO 2870

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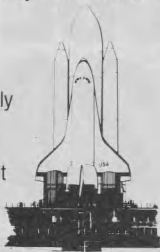
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**Listing 1 continued.**

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2980 B5=0 : GOSUB 2790
2990 Z$="F+" : GOSUB 520
3000 IF B5=2 THEN Z$="P8" : GOSUB 520 : GOTO 2870
3010 GOTO 2980
3020 REM
3030 REM ALIGN FRONT CORNER CUBIES
3040 GOTO 3130
3050 IF F(3,3)=F(2,2) THEN B5=B5+1
3060 RETURN
3070 IF F(3,1)=F(2,2) THEN B5=B5+1
3080 RETURN
3090 IF F(1,1)=F(2,2) THEN B5=B5+1
3100 RETURN
3110 IF F(1,3)=F(2,2) THEN B5=B5+1
3120 RETURN
3130 B5=0 : GOSUB 3050 : GOSUB 3070 : GOSUB 3090 : GOSUB 3110
3140 Z$=""
3150 IF B5<>4 THEN 3190
3160 IF U(3,1)<>U(2,3) THEN Z$="F+" : GOSUB 520 : GOTO 3160
3170 GOSUB 1040
3180 PRINT "FRONT FACE CORNER CUBIES COLOR ALIGNED":RETURN
3190 IF B5=0 THEN 3420
3200 IF B5<>1 THEN 3240
3210 B5=0 : GOSUB 3050
3220 IF B5=1 THEN 3420
3230 Z$="F+" : GOSUB 520 : GOTO 3210
3240 IF B5<>2 THEN 3370
3250 B5=0 : GOSUB 3050 : GOSUB 3090
3260 IF B5=2 THEN 3420
3270 B5=0 : GOSUB 3070 : GOSUB 3110
3280 IF B5=2 THEN 3410
3290 B5=0 : GOSUB 3050 : GOSUB 3070
3300 IF B5=2 THEN 3410
3310 B5=0 : GOSUB 3070 : GOSUB 3090
3320 IF B5=2 THEN 3420
3330 B5=0 : GOSUB 3090 : GOSUB 3110
3340 IF B5=2 THEN 3410
3350 B5=0 : GOSUB 3110 : GOSUB 3050
3360 IF B5=2 THEN 3400
3370 IF B5<>3 THEN STOP : REM ERROR
3380 B5=0 GOSUB 3110
3390 IF B5=1 THEN Z$="F+" : GOSUB 520 : GOTO 3380
3400 Z$="F+F+P9":GOSUB 520:GOTO 3130
3410 Z$="F+P9":GOSUB 520:GOTO 3130
3420 Z$="P9":GOSUB 520:GOTO 3130
3430 REM
3440 REM COMPLETE FRONT FACE
3450 FOR W6=1 TO 4
3460 IF L(2,3)=F(2,2) THEN S=U(1,2) : GOTO 3570
3470 IF U(1,2)=F(2,2) THEN S=L(2,3) : GOTO 3580
3475 Z$="Y-":GOSUB 520
3480 NEXT W6
3490 FOR W6=1 TO 4
3500 IF F(3,2)<>F(2,2) THEN Z$="P5Y+" : GOSUB 520 : GOTO 3450
3510 IF R(3,1)<>R(3,2) THEN Z$="PSY+" : GOSUB 520 :GOTO 3450
3520 Z$="F+" : GOSUB 520
3530 NEXT W6
3540 IF U(2,1)<>U(2,3) THEN Z$="F+" : GOSUB 520 : GOTO 3540
3545 IF U(2,2)<>U(2,3) THEN Z$="Y+":GOSUB 520:GOTO 3545
3550 GOSUB 1040
3560 PRINT "FRONT FACE FINISHED":RETURN
3570 GOSUB 3590 : Z$="Y-P5" : GOSUB 520 : GOTO 3450
3580 GOSUB 3590 : Z$="P5P5" : GOSUB 520 : GOTO 3450
3590 IF R(3,1)<>S THEN Z$="F+":GOSUB 520:GOTO 3590
3600 RETURN
3610 REM
3620 REM FINISH CENTER SLICE
3625 S=L(1,2)
3630 IF U(2,2)<>U(2,3) THEN Z$="Y+":GOSUB 520:GOTO 3630
3640 FOR W6=1 TO 4
3650 IF L(2,3)=L(1,2) AND U(1,2)=U(2,3) THEN 3710
3660 IF L(2,3)=U(2,3) AND U(1,2)=L(1,2) THEN 3700
3670 Z$="C+" : GOSUB 520
3680 NEXT W6
3690 Z$="P6" : GOSUB 520 : GOTO 3640
3700 Z$="P7" : GOSUB 520
3710 Z$="C-" : GOSUB 520
3720 FOR W6=1 TO 4
3730 IF L(2,3)=L(1,2) AND U(1,2)=U(2,3) THEN 3780
3740 IF L(2,3)=U(2,3) AND U(1,2)=L(1,2) THEN 3770
3750 Z$="P6" : GOSUB 520
3760 NEXT W6
3770 Z$="P7" : GOSUB 520
3780 Z$="C-" : GOSUB 520
3790 IF L(2,3)=L(1,2) AND U(1,2)=U(2,3) THEN 3825
3800 IF L(2,3)=U(2,3) AND U(1,2)=L(1,2) THEN 3820
3810 STOP
3820 Z$="P7" : GOSUB 520
3825 Z$="C2":GOSUB 520
3826 IF L(1,2)<>S THEN Z$="B-":GOSUB 520:GOTO 3825
3830 IF L(1,2)<>L(2,2) THEN Z$="Y+":GOSUB 520 :GOTO 3830
3840 IF L(3,2)<>L(1,2) THEN Z$="F+":GOSUB 520:GOTO 3840
3860 GOSUB 1040
3870 PRINT "CUBE FINISHED":PRINT:RETURN
3880 REM PLACE BACK EDGE CUBIES

```

More →



## Listing 1 continued.

```

3890 Q5=0:FOR Q6=1 TO 4
3900 IF B(2,1)=B(2,2) AND U(2,3)=U(2,2) THEN 3960
3910 Q5=1
3920 IF B(2,1)<>B(2,2) AND U(2,3)<>B(2,2) THEN 3960
3930 IF F(2,3)<>B(2,2) AND U(2,1)<>B(2,2) THEN 3950
3940 Z$="F+":GOSUB 520:GOTO 3930
3950 Z$="U2":GOSUB 520
3960 Z$="C+":GOSUB 520
3970 NEXT Q6
3980 IF Q5=0 THEN 4160 : REM BACK SIDE DONE
3990 GOSUB 1040:PRINT "*"
4000 REM MOVE FROM CS TO FRONT
4010 FOR Q6=1 TO 4
4020 IF L(2,3)<>B(2,2) AND U(1,2)<>B(2,2) THEN 4060
4030 IF L(3,2)<>B(2,2) AND F(1,2)<>B(2,2) THEN 4050
4040 Z$="F+":GOSUB 520: GOTO 4030
4050 Z$="U-F+U+": : GOSUB 520
4060 Z$="Y+":GOSUB 520 : NEXT Q6
4070 GOSUB 1040:PRINT "*"
4080 REM
4090 FOR Q5=1 TO 4
4100 FOR Q6=1 TO 4
4110 IF L(3,2)<>B(2,2) AND F(1,2)<>B(2,2) THEN 4140
4120 IF F(1,2)=U(2,2) THEN Z$="P3":GOSUB 520:GOTO 4150
4130 IF L(3,2)=U(2,2) THEN Z$="P4":GOSUB 520:GOTO 4150
4140 Z$="F+":GOSUB 520:NEXT Q6
4150 Z$="C+":GOSUB 520:NEXT Q5
4160 GOSUB 1040
4170 PRINT "BACK FACE EDGE CUBIES IN PLACE":RETURN
4180 REM PLACE BACK CORNER CUBIES
4190 Q6=0
4200 FOR Q5=1 TO 4
4210 IF B(3,1)=B(2,2) AND U(3,3)=U(2,3) AND R(1,1)=R(1,2) THEN 4260
4215 FOR Q7=1 TO 4
4220 IF F(3,1)<>B(2,2) AND R(3,3)<>B(2,2) AND D(3,3)<>B(2,2) THEN 4240
4230 Z$="F+":GOSUB 520:NEXT Q7:GOTO 4275
4240 Z$="U-F-U+":GOSUB 520
4250 Q6=1
4260 Z$="B-":GOSUB 520:NEXT Q5
4270 IF Q6=0 THEN 4430
4275 GOSUB 1040:PRINT "*"
4280 REM
4290 FOR Q5=1 TO 4
4300 IF L(3,1)<>B(2,2) AND D(1,3)<>B(2,2) AND F(1,1)<>B(2,2) THEN 4390
4310 FOR Q6=1 TO 4
4320 IF L(3,1)<>U(2,3) AND F(1,1)<>U(2,3) AND D(1,3)<>U(2,3) THEN 4370
4330 IF L(3,1)<>R(1,2) AND F(1,1)<>R(1,2) AND D(1,3)<>R(1,2) THEN 4370
4340 IF L(3,1)=B(2,2) THEN Z$="P0":GOSUB 520:GOTO 4290
4350 IF D(1,3)=B(2,2) THEN Z$="P1":GOSUB 520:GOTO 4290
4360 IF F(1,1)=B(2,2) THEN Z$="P2":GOSUB 520:GOTO 4290
4370 Z$="B-":GOSUB 520
4380 NEXT Q6
4390 Z$="F+":GOSUB 520
4400 NEXT Q5
4410 IF U(2,2)<>U(2,3) THEN Z$="B-":GOSUB 520:GOTO 4410
4420 GOSUB 1040
4430 PRINT "BACK FACE FINISHED":RETURN
4440 END

```

Listing 2. Program modifications to use the Rubik's cube program on an Apple II with Applesoft. The only real changes involve the tab statements (in lines 1690, 1710, 1730, 1770, 1790 and 1810) so that cube representation fits on the Apple's 40-column display. If you use an 80-column board in your Apple, these changes can be ignored. Whether or not you have an 80-column display in your Apple, you will want to change line 1930 so that the error-indicating arrow lines up properly with an input error.

```

1690 PRINT TAB( 11);"! "; CHR$( U(1,J));" "; CHR$( U(2,J));" ";
1710 PRINT TAB( 4);"-----+-----+-----"
1730 PRINT TAB( 3);"! "; CHR$( L(1,J));" " CHR$( L(2,J));
1770 PRINT TAB( 31);"! "; CHR$( B(1,Y));" "; CHR$( B(2,Y));
1790 PRINT TAB( 4);"-----+-----+-----"
1810 PRINT TAB( 11);"! "; CHR$( D(1,J));" "; CHR$( D(2,J));
1930 PRINT : PRINT TAB( W);"^ERROR":EE = 1: RETURN

```

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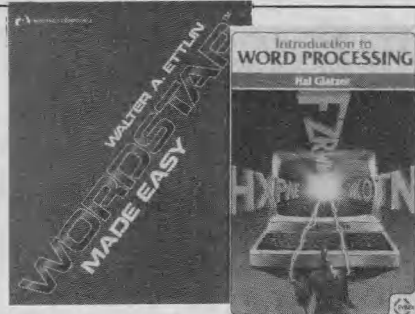
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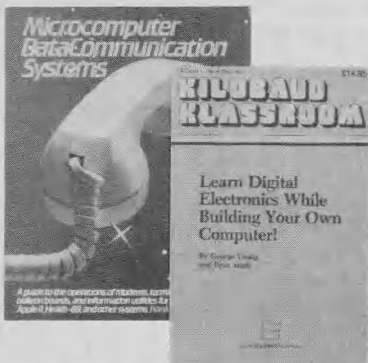
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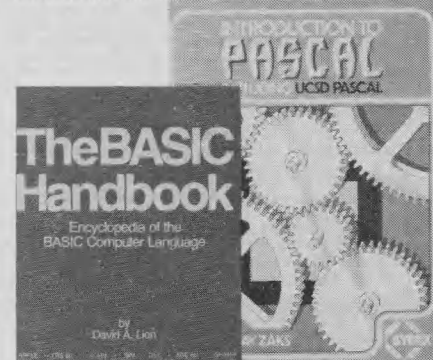
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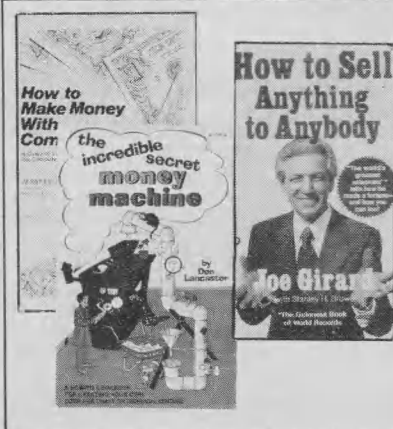
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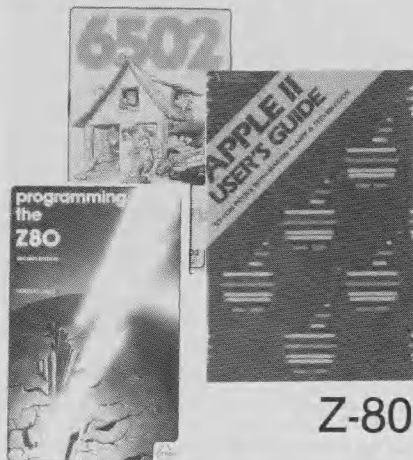
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6502

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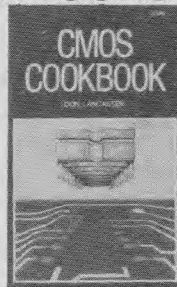
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SFC-55009047F	CP/M 2.2 with VF II	\$99.95

### 2242 DISK CONTROLLER - C.C.S.

5 1/4" or 8" double density disk controller with on-board boot loader ROM, free CP/M 2.2 & manual set.

IOD-1300A	A & T with CP/M 2.2	\$399.95
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### DOUBLE D - Jade

High reliability double density disk controller with on-board Z-80A, auxiliary printer port, IEEE S-100, can function in multi-user interrupt driven bus.

IOD-1200B	Bare board & h/wr man	\$59.95
IOD-1200K	Kit w/h/wr & sftwr man	\$299.95
IOD-1200A	A & T w/h/wr & sftwr man	\$325.95
SFC-59002001F	CP/M 2.2 with Double D	\$99.95

## S-100 Memory Boards

### 256K RAMDISK - SD Systems

ExpandoRAM III expandable from 64K to 256K using 64K x 1 RAM chips, compatible with CP/M, MP/M, Oasis, Cromemco, & most other Z-80 based systems, functions as ultra-high speed disk drive when used with optional RAMDISK software.

MEM-65064A	64K A & T	\$474.95
MEM-65128A	128K A & T	\$574.95
MEM-65192A	192K A & T	\$674.95
MEM-65256A	256K A & T	\$774.95
SFC-55009000F	RAMDISK sftwr CP/M 2.2	\$44.95
SFC-55009000F	RAMDISK with EXRAM III	\$24.95

### 128K RAM 21 - CompuPro

128K x 8 bit or 64K x 16 bit static RAM board, 12 MHz, 24 bit addressing.

MEM-12810A	A & T	\$1609.95
MEM-12810C	CSC	\$1794.95

### 64K RAM 17 - CompuPro

64K CMOS static RAM board, 10 MHz, low power less than 4 watts, DMA compatible, 24 bit addressing.

MEM-64180A	64K A & T	\$549.95
MEM-64180C	64K CSC	\$698.95

### 64K RAM 16 - CompuPro

32K x 16 bit or 64K x 8 bit low power static RAM board, 10 MHz, 24 bit addressing.

MEM-32180A	RAM 16 A & T	\$598.95
MEM-32180C	RAM 16 CSC	\$698.95

### 64K STATIC RAM - SSM

IEEE 696/S-100 standard, up to 6MHz/8 Bit, 12MHz/16 Bit, 24 Bit extended addressing, disable-able in 2K increments

MEM-64300A	A & T	\$499.95
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### 64K STATIC RAM - Mem Merchant

64K static S-100 RAM card, 4 to 16K banks up to 8 MHz.

MEM-64400A	64K A & T	\$499.95
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### 2065 64K RAM - C.C.S.

4 MHz bank port/bank byte selectable, extended addressing, 16K bank selectable, front panel compatible.

MEM-64565A	64K A & T	\$349.95
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### 2066 64K RAM - C.C.S.

64K RAM board with bank and block select switching functions for Cromemco Cromix & Alpha Micro.

MEM-64566A	64K A & T	\$424.95
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### 64K EXPANDORAM II - SD Systems

Expandable RAM board from 16K to 64K using 4116 RAM chips.

MEM-16630A	16K A & T	\$344.95
MEM-32631A	32K A & T	\$364.95
MEM-48632A	48K A & T	\$384.95
MEM-64633A	64K A & T	\$399.95

### MEMORY BANK - Jade

4 MHz S-100 bank selectable expandable to 64K.

MEM-99730B	Bare board w/manual	\$49.95
MEM-99730K	Kit with no RAM	\$179.95
MEM-32731K	32K kit	\$199.95
MEM-64733K	64K kit	\$249.95
Assembled & Tested		add \$50.00

### 32K RAM 20 - CompuPro

32K static RAM, up to 10 MHz, disable-able in 4K banks, bank select or 24 bit addressing.

MEM-16180A	16K A & T	\$259.95
MEM-16180C	16K CSC	\$324.95
MEM-24180A	24K A & T	\$324.95
MEM-24180C	24K CSC	\$384.95
MEM-32185A	32K A & T	\$384.95
MEM-32185C	32K CSC	\$449.95

### 16K STATIC RAM - Mem Merchant

4MHz lo-power static RAM board, IEEE S-100, bank selectable, addressable in 4K blocks, disable-able in 1K segments extended addressing.

MEM-16171A	16K A & T	\$149.95
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## S-100 I/O Boards

### SYSTEM SUPPORT 1 - CompuPro

Real time clock, three 16 bit interval timers, dual interrupt controllers(15 levels), up to 4K EPROM/RAM, RS-232C serial channel, provision for 9511A/9512 math chip.

IOX-1850A	SS1 A & T	\$359.95
IOX-1850C	SS1 CSC	\$459.95
IOX-1855A	with 9511 A & T	\$554.95
IOX-1855C	with 9511 CSC	\$654.95
IOX-1860A	with 9512 A & T	\$554.95
IOX-1860C	with 9512 CSC	\$654.95

### INTERFACER 1 - CompuPro

2 serial I/O ports 50-19.2K baud.

IOI-1810A	A & T	\$218.95
IOI-1810C	CSC	\$288.95

### INTERFACER 2 - CompuPro

3 parallel, 1 serial, & interrupt timer.

IOI-1820A	A & T	\$218.95
IOI-1820C	CSC	\$288.95

### INTERFACER 3 - CompuPro

5 or 8 channel serial I/O board for interrupt driven multi-user systems up to 250K baud.

IOI-1835A	5 port A & T	\$558.95
IOI-1835C	5 port CSC	\$628.95
IOI-1838A	8 port A & T	\$628.95
IOI-1838C	8 port CSC	\$749.95

### INTERFACER 4 - CompuPro

3 serial, 1 parallel, 1 Centronics parallel.

IOI-1840A	A & T	\$314.95
IOI-1840C	CSC	\$414.95

### MPX - CompuPro

Multi-user I/O multiplexer & interrupt controller with on-board 8085A-2 CPU & 4K or 16K of RAM.

IOI-1875A	4K MPX A & T	\$444.95
IOI-1875C	4K MPX CSC	\$534.95
IOI-1880A	16K MPX A & T	\$584.95
IOI-1880C	16K MPX CSC	\$674.95

### I/O-8 - SSM Microcomputer

Eight software programmable serial I/O ports, 110 -19.2K Baud, ideal for multi-user systems

IOI-1018A	A & T	\$469.95
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### I/O-5 - SSM Microcomputer

Two serial & 3 parallel I/O ports, 110-19.2K Baud

IOI-1015A	A & T	\$289.95
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### MPC-4 - SD Systems

Intelligent 4-port serial I/O card, on-board Z-80A, 2K RAM, 4K PROM area, on-board firmware, fully buffered, vectored interrupts, four CTC channels, add to SD Board set for powerful multi-user system

IOI-1504A	A & T w/software	\$495.00
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### I/O-4 - SSM Microcomputer

2 serial I/O ports plus 2 parallel I/O ports.

IOI-1010B	Bare board w/manual	\$35.00
IOI-1010K	Kit with manual	\$179.95
IOI-1010A	A & T with manual	\$249.95

### 2830 6 PORT SERIAL - C.C.S.

Six asynchronous RS-232C serial I/O ports with programmable baud rates.

IOI-1040A	A & T with manual	\$529.95
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### 2710 4 PORT SERIAL - C.C.S.

Four RS-232C serial I/O ports with full handshaking.

IOI-1060A	A & T with manual	\$319.95
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### 2719 2 SER & 2 PAR - C.C.S.

Two RS-232C serial I/O ports plus two 8 bit parallel I/O ports.

IOI-1080A	A & T with manual	\$349.95
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Circle 48 on Reader Service card.

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**MX-80FT with GRAFTRAX-plus** same as MX-80 with friction feed and pin feed.

PRM-28082 MX-80FT w/GRAFTRAX-plus ..... \$539.95

**MX-100 with GRAFTRAX-plus** 132/232 column, correspondence quality, up to 15" paper, friction feed & adjustable pin feed, 18 x 18 dot matrix, 80 CPS.

PRM-28100 MX-100 w/GRAFTRAX-plus ..... \$729.95

PRA-27084 Serial interface ..... \$54.95

PRA-27088 Serial int'l & 2K buffer ..... \$99.95

PRA-27081 Apple card ..... \$39.95

PRA-27082 Apple cable ..... \$19.95

PRA-27086 IEEE 488 card ..... \$59.95

PRA-27087 TRS-80 cable ..... \$24.95

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PRA-27197 GRAFTRAX-plus 100 ..... \$64.95

PRA-27090 MX-80, FT print head ..... \$44.95

PRA-27190 MX-100 print head ..... \$49.95

PRA-27083 MX-80 ribbon cart. .... \$13.95

PRA-27101 MX-100 ribbon only ..... \$9.95

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PRM-43082 Friction & pin feed ..... \$479.95

**Microline 83A** 132/232 column, 120 CPS, forms up to 15" wide, removable tractor, plus all the features of the 82A.

PRM-43083 with FREE tractor ..... \$699.95

**Microline 84** 132/232 column, Hi-speed 200 CPS, full dot graphics built in, plus all the features of the 83A.

PRM-43084 Centronics parallel ..... \$1099.95

PRM-43085 Serial with 2K buffer ..... \$1149.95

PRA-27081 Apple card ..... \$39.95

PRA-27082 Apple cable ..... \$19.95

PRA-27087 TRS-80 cable ..... \$24.95

PRA-43081 2K hi speed serial card ..... \$99.95

PRA-43082 Hi-res graphics ROMs 82A ..... \$49.95

PRA-43083 Hi-res graphics ROMs 83A ..... \$49.95

PRA-43088 Tractor option for 82A ..... \$49.95

PRA-43080 Extra ribbons pkg. of 2 ..... \$9.95

### 8023 DOT MATRIX - NEC

100 CPS, proportional spacing, hi-resolution graphics, correspondence quality printing, bi-directional tractor & friction feed.

NEC-8023A 8023 parallel ..... \$499.95

NEC-8023-01 8023 ribbon ..... \$11.95

### TP-1 LETTER QUALITY - SCM

12 CPS daisy wheel printer from Smith Corona.

PRD-45101 Centronics parallel ..... \$648.95

PRD-45102 RS-232C serial ..... \$648.95

### LETTER QUALITY PRINTER - Jade

Uses standard daisy wheels and ribbon cartridges, 16 CPS bi-directional printing, semi-automatic paper loader (single sheet or fan fold), 10/12/15 pitch, up to 16" paper, built-in noise suppression cover.

PRD-11001 Centronics parallel ..... \$899.95

PRD-11002 RS-232C serial model ..... \$969.95

PRA-11000 Tractor Option ..... \$169.95

### STARWRITER F-10 - C. Itoh

New 40 CPS daisy wheel printer with full 15" carriage, uses standard Diablo print wheels and ribbons, both parallel and serial interfaces included.

PRD-22010 Starwriter F-10 ..... \$1495.95

### PRINTER PALS - F.M.J. Inc.

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PRA-99080 for MX-80, MX-80FT, Oki 82A, NEC ..... \$29.95

PRA-99100 for MX-100, Oki 83A & 84 ..... \$34.95

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MSM-104550 ..... \$349.95 ea 2 for \$329.95 ea

**Shugart SA465** half-size double-sided 96 TPI

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**Tandon TM100-2** double-sided double-density 48 TPI

MSM-551002 ..... \$294.95 ea 2 for \$269.95 ea

**Shugart SA450** double-sided double-density 35 track

MSM-104500 ..... \$349.95 ea 2 for \$329.95 ea

**Tandon TM100-3** single-sided double-density 96 TPI

MSM-551003 ..... \$294.95 ea 2 for \$269.95 ea

**Tandon TM100-4** double-sided double-density 96 TPI

MSM-551004 ..... \$394.95 ea 2 for \$374.95 ea

**MPI B-51** single-sided double-density 40 track

MSM-155100 ..... \$234.95 ea 2 for \$224.95 ea

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MSM-155200 ..... \$344.95 ea 2 for \$334.95 ea

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MSM-155300 ..... \$369.95 ea 2 for \$359.95 ea

**MPI B-92** double-sided double-density 77 track

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END-000226 Dual cab w/power supply ..... \$94.95

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**Shugart SA801R** single-sided double-density

MSF-10801R ..... \$394.95 ea 2 for \$379.95 ea

**Shugart SA851R** double-sided double-density

MSF-10851R ..... \$554.95 ea 2 for \$529.95 ea

**Tandon TM848-1** single-sided double-den thin-line

MSF-558481 ..... \$379.95 ea 2 for \$369.95 ea

**Tandon TM848-2** double-sided double-den thin-line

MSF-558482 ..... \$494.95 ea 2 for \$484.95 ea

**Qume DT-8** double-sided double-density

MSF-750080 ..... \$524.95 ea 2 for \$498.95 ea

**Mitsubishi M2894-63** double-sided double-density

MSF-289463 ..... \$494.95 ea 2 for \$474.95 ea

**Siemens FDD 100-8** single-sided double-density

SF-201120 ..... \$384.95 ea 2 for \$349.95 ea

## Dual Disk Sub-Systems

### Disk Sub-Systems - Jade

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12 Megabyte Winchester sub-system for most CP/M based microcomputers including Apple II, S-100, IBM PC, NEC, Xerox, TRS-80 II, Heath H-89, and others. Sub-system includes interface, controller, cabinet, power supply, CP/M software patch, & cables - ready to just plug in and run. A 1 Megabyte back-up drive is also available.

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### THE BUS PROBE - Jade

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Whether you're a hobbyist with a cantankerous kluge or a field technician with an anxious computer owner breathing down your neck, you'll find **THE BUS PROBE** speeds your repair time remarkably. Just plug in **THE BUS PROBE** and you'll be able to see all the IEEE S-100 signals in action. **THE BUS PROBE** allows you to see inputs, outputs, memory reads and writes, instruction fetches, DMA channels, vectored interrupts, 8 or 16 bit wide data transfers, plus the three bus supply voltages.

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TSX-200B Bare board ..... \$59.95

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### PLANNER CALC - Target Software

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Color Monitor	\$829.00
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2111	256 x 4 (450ns)	2.99
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2114L-4	1024 x 4 (450ns) (LP)	8/15.25
2114L-3	1024 x 4 (300ns) (LP)	8/15.45
2114L-2	1024 x 4 (200ns) (LP)	8/15.95
2147	4096 x 1 (55ns)	9.95
TMS4044-4	4096 x 1 (450ns)	3.49
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TMS4044-2	4096 x 1 (200ns)	4.49
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HM6116-3	2048 x 8 (150ns) (cmos)	7.10
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LP Low Power Qstat Quasi-Static

## DYNAMIC RAMS

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4116-300	16384 x 1 (300ns)	8/11.75
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4116-150	16384 x 1 (150ns)	8/15.95
4116-120	16384 x 1 (120ns)	8/29.95
2118	16384 x 1 (150ns) (5v)	4.95
MK4816	2048 x 8 (300ns) (5v)	24.95
4164-200	65536 x 1 (200ns) (5v)	7.25
4164-150	65536 x 1 (150ns) (5v)	8.25

5V single 5 volt supply

## EPROMS

1702	256 x 8 (1us)	4.50
2708	1024 x 8 (450ns)	3.95
2758	1024 x 8 (450ns) (5v)	9.95
2716	2048 x 8 (450ns) (5v)	3.95
2716-1	2048 x 8 (350ns) (5v)	7.95
TMS2716	2048 x 8 (450ns)	9.95
TMS2532	4096 x 8 (450ns) (5v)	7.95
2732	4096 x 8 (450ns) (5v)	6.95
2732-250	4096 x 8 (250ns) (5v)	12.95
2732-200	4096 x 8 (200ns) (5v)	16.95
2764	8192 x 8 (450ns) (5v)	16.95
2764-250	8192 x 8 (250ns) (5v)	18.95
2764-200	8192 x 8 (200ns) (5v)	19.95
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5v Single 5 Volt Supply

## EPROM ERASERS

	Timer	Capacity Chip	Intensity (uW/Cm <sup>2</sup> )	
PE-14		6	5,200	83.00
PE-14T	X	6	5,200	119.00
PE-24T	X	9	6,700	175.00
PL-265T	X	20	6,700	255.00
PR-125T	X	16	15,000	349.00
PR-320	X	32	15,000	595.00

## DISC CONTROLLERS

1771	20.95
1791	29.95
1793	38.95
1795	54.95
1797	54.95
6843	34.95
8272	39.95
UPD765	39.95
1691	18.95
2143	18.95

## INTERFACE

8T26	1.69
8T28	2.49
8T95	.99
8T96	.99
8T97	.99
8T98	.99
DM8131	2.95
DP8304	2.29
DS8835	1.99
DS8836	.99

## MISC.

3242	7.95
3341	4.95
MC3470	4.95
MC3480	9.00
11C90	13.95
95H90	7.95
2513-001 UP	9.95
2513-002 LOW	9.95

## SOUND CHIPS

76477	3.95
76489	8.95
AY3-8910	12.95
MC3340	1.49

## CRT CONTROLLERS

6845	14.95
68B45	35.95
HD46505SP	15.95
6847	12.25
68047	24.95
8275	29.95
7220	99.95
CRT5027	39.95
CRT5037	49.95
TMS918A	39.95

## BIT-RATE GENERATORS

MC14411	11.95
BR1941	11.95
4702	12.95
COM5016	16.95
COM8116	10.95
MM5307	10.95

## UARTS

AY3-1014	6.95
AY5-1013	3.95
PT1472	9.95
TR1602	3.95
2350	9.95
2651	18.95
TMS6011	5.95
IM6402	7.95
IM6403	8.95
INS8250	14.95

## KEYBOARD CHIPS

AY5-2376	11.95
AY5-3600	11.95
74C922	5.25
74C923	5.50

## CLOCK CIRCUITS

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MM5369	3.95
MM5375	4.95
MM58167	8.95
MM58174	11.95
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## Z-80 2.5 Mhz

Z80-CPU	3.95
Z80-CTC	5.95
Z80-DART	15.25
Z80-DMA	17.50
Z80-PIO	5.75
Z80-SIO/0	18.50
Z80-SIO/1	18.50
Z80-SIO/2	18.50
Z80-SIO/9	16.95

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Z80A-CPU	6.00
Z80A-CTC	8.65
Z80A-DART	18.75
Z80A-DMA	27.50
Z80A-PIO	6.00
Z80A-SIO/0	22.50
Z80A-SIO/1	22.50
Z80A-SIO/2	22.50
Z80A-SIO/9	19.95

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Z80B-CPU	17.95
Z80B-CTC	15.50
Z80B-PIO	15.50

## ZILOG

Z6132	34.95
Z8671	39.95

## CRYSTALS

32.768 khz	1.95
1.0 mhz	4.95
1.8432	4.95
2.0	3.95
2.097152	3.95
2.4576	3.95
3.2768	3.95
3.579535	3.95
4.0	3.95
5.0	3.95
5.0688	3.95
5.185	3.95
5.7143	3.95
6.0	3.95
6.144	3.95
6.5536	3.95
8.0	3.95
10.0	3.95
14.31818	3.95
15.0	3.95
16.0	3.95
18.0	3.95
18.432	3.95
20.0	3.95
22.1184	3.95
32.0	3.95

## DATA ACQUISITION

ADC0800	15.55
ADC0804	4.95
ADC0809	5.25
ADC0817	10.95
DAC0800	4.95
DAC0806	2.25
DAC0808	4.95
DAC1020	8.25
DAC1022	8.25
MC1408L6	2.25
MC1408L8	4.95

## 8000

8035	7.25
8039	7.95
INS-8060	17.95
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8080	3.95
8085	7.95
8085A-2	11.95
8086	29.95
8087	CALL
8088	39.95
8089	89.95
8155	7.95
8156	8.95
8185	29.95
8185-2	39.95
8741	39.95
8748	29.95
8755	32.00

## 6800

68000	99.95
6800	4.95
6802	10.95
6808	13.90
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6809	12.95
6810	2.95
6820	4.95
6821	4.95
6828	14.95
6840	12.95
6843	34.95
6844	25.95
6845	14.95
6847	12.25
6850	3.45
6852	5.75
6860	10.95
6862	11.95
6875	6.95
6880	2.95
6883	24.95
68047	24.95
68488	19.95

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68B00	10.95
68B02	22.25
68B09E	29.95
68B09	29.95
68B10	7.95
68B21	12.95
68B45	35.95
68B50	12.95

## 68B00 2MHZ

## 6500

### 1 MHZ

6502	5.95
6504	6.95
6505	8.95
6507	9.95
6520	4.35
6522	8.75
6532	11.25
6545	22.50
6551	11.85

### 2 MHZ

6502A	9.95
6522A	11.70
6532A	12.40
6545A	28.50
6551A	12.95

### 3 MHZ

6502B	14.95
-------	-------

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MC4024	3.95
LM566	1.49
XR2206	3.75
8038	3.95

## EXAR

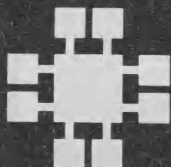
XR 2206	3.75
XR 2207	3.85
XR 2208	3.90
XR 2211	5.25
XR 2240	3.25

## INTERSIL

ICL7103	9.50
ICL7106	9.95
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ICL8038	3.95
ICM7107A	5.59
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9334	2.50
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9601	.75
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74LS00	.25	74LS86	.40	74LS169	1.75	74LS323	2.75
74LS01	.25	74LS90	.65	74LS170	1.75	74LS324	1.75
74LS02	.25	74LS91	.89	74LS173	.80	74LS352	1.55
74LS03	.25	74LS92	.70	74LS174	.95	74LS353	1.55
74LS04	.25	74LS93	.65	74LS175	.95	74LS363	1.35
74LS05	.25	74LS95	.85	74LS181	2.15	74LS364	1.95
74LS08	.35	74LS96	.95	74LS189	9.95	74LS365	.95
74LS09	.35	74LS107	.40	74LS190	1.00	74LS366	.95
74LS10	.25	74LS109	.40	74LS191	1.00	74LS367	.70
74LS11	.35	74LS112	.45	74LS192	.85	74LS368	.70
74LS12	.35	74LS113	.45	74LS193	.95	74LS373	1.75
74LS13	.45	74LS114	.50	74LS194	1.00	74LS374	1.75
74LS14	1.00	74LS122	.45	74LS195	.95	74LS377	1.45
74LS15	.35	74LS123	.95	74LS196	.85	74LS378	1.18
74LS20	.25	74LS124	2.99	74LS197	.85	74LS379	1.35
74LS21	.35	74LS125	.95	74LS221	1.20	74LS385	1.90
74LS22	.25	74LS126	.85	74LS240	1.29	74LS386	.65
74LS26	.35	74LS132	.75	74LS241	1.29	74LS390	1.90
74LS27	.35	74LS133	.89	74LS242	1.85	74LS393	1.90
74LS28	.35	74LS136	.55	74LS243	1.85	74LS395	1.65
74LS29	.25	74LS137	.99	74LS244	1.29	74LS399	1.70
74LS32	.35	74LS138	.75	74LS245	1.90	74LS424	2.95
74LS33	.55	74LS139	.75	74LS247	.75	74LS447	.37
74LS37	.55	74LS145	1.20	74LS248	1.25	74LS490	1.95
74LS38	.35	74LS147	2.49	74LS249	.99	74LS624	3.99
74LS40	.35	74LS148	1.35	74LS251	1.30	74LS668	1.69
74LS42	.55	74LS151	.75	74LS253	.85	74LS669	1.89
74LS47	.75	74LS153	.75	74LS257	.85	74LS670	2.20
74LS48	.75	74LS154	2.35	74LS258	.85	74LS674	9.65
74LS49	.75	74LS155	1.15	74LS259	2.85	74LS682	3.20
74LS51	.25	74LS156	.95	74LS260	.65	74LS683	3.20
74LS54	.35	74LS157	.75	74LS266	.55	74LS684	3.20
74LS55	.35	74LS158	.75	74LS273	1.65	74LS685	3.20
74LS63	1.25	74LS160	.90	74LS275	3.35	74LS688	2.40
74LS73	.40	74LS161	.95	74LS279	.55	74LS689	3.20
74LS74	.45	74LS162	.95	74LS280	1.98	74LS783	24.95
74LS75	.50	74LS163	.95	74LS283	1.00	81LS95	1.69
74LS76	.40	74LS164	.95	74LS290	1.25	81LS96	1.69
74LS78	.50	74LS165	.95	74LS293	1.85	81LS97	1.69
74LS83	.75	74LS166	2.40	74LS295	1.05	81LS98	1.69
74LS85	1.15	74LS168	1.75	74LS298	1.20	25LS2521	2.80
						25LS2569	4.25

### IC SOCKETS

8 pin ST	1.99	100
14 pin ST	.13	.11
16 pin ST	.15	.12
18 pin ST	.17	.13
20 pin ST	.20	.18
22 pin ST	.29	.27
24 pin ST	.30	.27
28 pin ST	.40	.32
40 pin ST	.49	.39
ST SOLDER TAIL		
8 pin WW	.59	.49
14 pin WW	.69	.52
16 pin WW	.69	.58
18 pin WW	.99	.90
20 pin WW	1.09	.98
22 pin WW	1.39	1.28
24 pin WW	1.49	1.35
28 pin WW	1.69	1.49
40 pin WW	1.99	1.80
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24 pin ZIF 9.95 call		
ZIF TEXT TOOL		
(Zero Insertion Force)		

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RS232 FEMALE	3.75
RS232 FEMALE	
RIGHT ANGLE	5.25
RS232 HOOD	1.25
S-100 ST	3.95
S-100 WW	4.95

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4 POSITION	.85
5 POSITION	.90
6 POSITION	.90
7 POSITION	.95
8 POSITION	.95

### 7400

7400	.19	74132	.45
7401	.19	74136	.50
7402	.19	74141	.65
7403	.19	74142	2.95
7404	.19	74143	2.95
7405	.25	74145	.60
7406	.29	74147	1.75
7407	.29	74148	1.20
7408	.24	74150	1.35
7409	.19	74151	.65
7410	.19	74152	.65
7411	.25	74153	.55
7412	.30	74154	1.40
7413	.35	74155	.75
7414	.55	74156	.65
7416	.25	74157	.55
7417	.25	74159	1.65
7420	.19	74160	.85
7421	.35	74161	.70
7422	.29	74162	.85
7423	.29	74163	.85
7425	.29	74164	.85
7426	.29	74165	.85
7427	.29	74166	1.00
7428	.45	74167	2.95
7430	.19	74170	1.65
7432	.29	74172	5.95
7433	.45	74173	.75
7437	.29	74174	.89
7438	.29	74175	.89
7440	.19	74176	.89
7442	.49	74177	.75
7443	.65	74178	1.15
7444	.69	74179	1.75
7445	.69	74180	.75
7446	.59	74181	2.25
7447	.69	74182	.75
7448	.69	74184	2.00
7450	.19	74185	2.00
7451	.23	74186	18.50
7453	.23	74190	1.15
7454	.23	74191	1.15
7460	.23	74192	.79
7470	.35	74193	.79
7472	.29	74194	.85
7473	.34	74195	.85
7474	.35	74196	.79
7475	.49	74197	.75
7476	.35	74198	1.35
7480	.59	74199	1.35
7481	1.10	74221	1.35
7482	.95	74246	1.35
7483	.50	74247	1.25
7485	.65	74248	1.85
7486	.35	74249	1.95
7489	4.95	74251	.75
7490	.35	74259	2.25
7491	.40	74265	1.35
7492	.50	74273	1.95
7493	.49	74276	1.25
7494	.65	74279	.75
7495	.55	74283	2.00
7496	.70	74284	3.75
7497	2.75	74285	3.75
74100	1.75	74290	.95
74107	.30	74293	.75
74109	.45	74298	.85
74110	.45	74351	2.25
74111	.55	74365	.65
74116	1.55	74366	.65
74120	1.20	74367	.65
74121	.29	74368	.65
74122	.45	74376	2.20
74123	.55	74390	1.75
74125	.45	74393	1.35
74126	.45	74425	3.15
74128	.55	74426	.85
		74490	2.55

### CMOS

4000	.35	4528	1.25
4001	.35	4531	.95
4002	.25	4532	1.95
4006	.95	4538	1.95
4007	.29	4539	1.95
4008	.95	4543	2.70
4009	.45	4555	.95
4010	.45	4556	.95
4011	.35	4581	1.95
4012	.25	4582	1.95
4013	.45	4584	.95
4014	.95	4585	.95
4015	.95	4702	12.95
4016	.45	74C00	.35
4017	1.15	74C02	.35
4018	.95	74C04	.35
4019	.45	74C08	.35
4020	.95	74C10	.35
4021	.95	74C14	1.50
4022	1.15	74C20	.35
4023	.35	74C30	.35
4024	.75	74C32	.50
4025	.35	74C42	1.75
4026	1.65	74C48	1.20
4027	.65	74C73	.65
4028	.80	74C74	.85
4029	.95	74C76	.80
4030	.45	74C83	1.95
4034	2.95	74C85	1.95
4035	.85	74C86	.95
4040	.95	74C89	4.50
4041	1.25	74C90	1.75
4042	.75	74C93	1.75
4043	.85	74C95	1.75
4044	.85	74C107	1.00
4046	.95	74C150	5.75
4047	.95	74C151	2.25
4049	.55	74C154	3.25
4050	.55	74C157	1.75
4051	.95	74C160	2.00
4053	.95	74C161	2.00
4060	1.45	74C162	2.00
4066	.75	74C163	2.00
4068	.40	74C164	2.00
4069	.35	74C165	2.00
4070	.35	74C173	2.00
4071	.30	74C174	2.25
4072	.30	74C175	2.25
4073	.30	74C192	2.25
4075	.30	74C193	2.25
4076	.95	74C195	2.25
4078	.30	74C200	5.75
4081	.30	74C221	2.25
4082	.30	74C373	2.75
4085	.95	74C374	2.75
4086	.95	74C901	.80
4093	.95	74C902	.85
4098	2.49	74C903	.85
4099	1.95	74C905	10.95
14409	12.95	74C906	.95
14410	12.95	74C907	1.00
14411	11.95	74C908	2.00
14412	12.95	74C909	2.75
14419	4.95	74C910	9.95
4502	.95	74C911	10.00
4503	.65	74C912	10.00
4508	1.95	74C914	1.95
4510	.95	74C915	2.00
4511	.95	74C918	2.75
4512	.95	74C920	17.95
4514	1.25	74C921	15.95
4515	2.25	74C922	5.59
4516	1.55	74C923	5.95
4518	1.25	74C925	6.75
4519	1.25	74C926	7.95
4520	1.25	74C927	7.95
4522	1.25	74C928	7.95
4526	1.25	74C929	19.95
4527	1.95	74C930	19.95

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74S00	.32	74S163	1.95
74S02	.35	74S168	3.95
74S03	.35	74S169	3.95
74S04	.35	74S174	1.09
74S05	.35	74S175	1.09
74S08	.35	74S181	3.95
74S09	.40	74S182	2.95
74S10	.35	74S188	1.95
74S11	.35	74S189	6.95
74S15	.35	74S194	1.49
74S20	.35	74S195	1.49
74S22	.35	74S196	1.49
74S30	.35	74S197	1.49
74S32	.40	74S201	6.95
74S37	.88	74S225	7.95
74S38	.85	74S240	2.20
74S40	.35	74S241	2.20
74S51	.35	74S244	2.20
74S64	.40	74S251	.

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LM301	.34	LM350K	5.60	NE570	4.75	LM1800	2.99
LM301H	.79	LM350T	4.60	NE571	3.95	LM1812	8.25
LM307	.45	LM358	.98	NE592	2.75	LM1815	5.20
LM308	.98	LM359	1.79	LM703	.89	LM1818	2.90
LM308H	1.15	LM376	3.75	LM709	.59	LM1820	3.50
LM309H	1.95	LM377	2.29	LM710	.75	LM1830	3.50
LM309K	1.49	LM378	2.50	LM711	.79	LM1871	5.49
LM310	1.75	LM379	4.50	LM723	.49	LM1872	5.49
LM311	.64	LM380	1.29	LM723H	.55	LM1877	3.25
LM311H	.89	LM380N-8	1.10	LM733	.98	LM1889	2.49
LM312H	1.75	LM381	1.60	LM741N-8	.35	LM1896	1.75
LM317K	3.95	LM382	1.60	LM741N-14	.35	LM2877	2.05
LM317T	1.95	LM383	1.95	LM741H	.40	LM2878	2.25
LM318	1.49	LM384	1.95	LM747	.79	LM2900	.85
LM318H	1.59	LM386	1.50	LM748	.59	LM2901	1.00
LM319H	1.25	LM387	1.40	LM1014	2.75	LM3900	.59
LM319	1.25	LM389	1.35	LM1303	1.95	LM3905	1.25
LM320 (see 7900)		LM390	1.95	LM1304	1.19	LM3909	.98
LM322	1.65	LM392	.69	LM1305	1.49	LM3911	2.25
LM323K	4.95	LM394H	4.60	LM1307	.85	LM3914	3.95
LM324	.59	LM399H	5.00	LM1310	2.90	LM3915	3.95
LM329	.69	NE531	3.75	MC1330	1.89	LM3916	3.95
LM331	3.95	NE536	6.00	MC1349	1.89	MC4024	3.95
LM334	1.30	NE555	.39	MC1350	1.29	MC4044	4.50
LM335	1.40	NE556	.69	MC1358	1.79	RC4136	1.25
LM336	1.75	NE558	1.50	LM1414	1.59	RC4151	3.95
LM337K	3.95	NE561	19.95	LM1458	.69	LM4250	1.75
LM337T	2.95	NE562	6.00	LM1488	.99	LM4500	3.25
LM338K	6.95	NE564	3.95	LM1489	.99	LM13080	1.29
LM339	.99	LM565	.99	LM1496	.85	LM13600	1.49
LM340 (see 7800)		LM566	1.49	LM1558H	3.10	LM13700	1.49
LM348	1.20	LM567	1.29				

H = TO-5 CAN

T = TO-220

K = TO-3

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CA 3013	2.00	CA 3082	1.65
CA 3023	2.75	CA 3083	1.55
CA 3035	2.49	CA 3086	.80
CA 3039	1.29	CA 3089	2.99
CA 3046	1.25	CA 3096	3.49
CA 3053	1.45	CA 3130	1.30
CA 3059	2.90	CA 3140	1.15
CA 3060	2.90	CA 3146	1.85
CA 3065	1.75	CA 3160	1.19
CA 3080	1.10	CA 3401	.59
		CA 3600	3.45

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TL496	1.65	75450	.59
TL497	3.25	75451	.39
75107	1.49	75452	.39
75110	1.95	75453	.39
75150	1.95	75454	.39
75154	1.95	75491	.79
75188	1.25	75492	.79
75189	1.25	75493	.89
		75494	.89

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TL072	1.19	LF347	2.19
TL074	2.19	LF351	.60
TL081	.79	LF353	1.00
TL082	1.19	LF355	1.10
TL083	1.19	LF356	1.10
		LF357	1.40

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7815T	.89	7915T	.99
7824T	.89	7924T	.99
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7812K	1.39	7912K	1.49
7815K	1.39	7915K	1.49
7824K	1.39	7924K	1.49
78L05	.69	79L05	.79
78L12	.69	79L12	.79
78L15	.69	79L15	.79
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T = TO-220 K = TO-3  
L = TO-92

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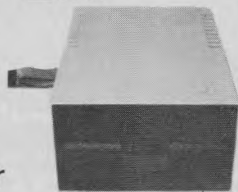




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7406	21	7474	30
7408	23	7475	30
7409	18	7476	30
7410	18	7480	55
7411	22	7481	30
7412	32	7482	30
7413	32	7483	30
7414	45	7484	30
7415	24	7485	30
7416	24	7486	30
7417	24	7487	30
7418	18	7488	30
7419	30	7489	30
7420	25	7490	30
7421	25	7491	30
7422	25	7492	30
7423	25	7493	30
7424	25	7494	30
7425	25	7495	30
7426	25	7496	30
7427	25	7497	30
7428	25	7498	30
7429	25	7499	30
7430	25	7500	30
7431	25	7501	30
7432	25	7502	30
7433	25	7503	30
7434	25	7504	30
7435	25	7505	30
7436	25	7506	30
7437	25	7507	30
7438	25	7508	30
7439	25	7509	30
7440	25	7510	30
7441	25	7511	30
7442	25	7512	30
7443	25	7513	30
7444	25	7514	30
7445	25	7515	30
7446	25	7516	30
7447	25	7517	30
7448	25	7518	30
7449	25	7519	30
7450	25	7520	30
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74LS16	24	74LS133	90
74LS18	24	74LS134	90
74LS20	24	74LS135	90
74LS22	24	74LS136	90
74LS24	24	74LS137	90
74LS26	24	74LS138	90
74LS28	24	74LS139	90
74LS30	24	74LS140	90
74LS32	24	74LS141	90
74LS34	24	74LS142	90
74LS36	24	74LS143	90
74LS38	24	74LS144	90
74LS40	24	74LS145	90
74LS42	24	74LS146	90
74LS44	24	74LS147	90
74LS46	24	74LS148	90
74LS48	24	74LS149	90
74LS50	24	74LS150	90
74LS52	24	74LS151	90
74LS54	24	74LS152	90
74LS56	24	74LS153	90
74LS58	24	74LS154	90
74LS60	24	74LS155	90
74LS62	24	74LS156	90
74LS64	24	74LS157	90
74LS66	24	74LS158	90
74LS68	24	74LS159	90
74LS70	24	74LS160	90
74LS72	24	74LS161	90
74LS74	24	74LS162	90
74LS76	24	74LS163	90
74LS78	24	74LS164	90
74LS80	24	74LS165	90
74LS82	24	74LS166	90
74LS84	24	74LS167	90
74LS86	24	74LS168	90
74LS88	24	74LS169	90
74LS90	24	74LS170	90
74LS92	24	74LS171	90
74LS94	24	74LS172	90
74LS96	24	74LS173	90
74LS98	24	74LS174	90
74LS100	24	74LS175	90
74LS102	24	74LS176	90
74LS104	24	74LS177	90
74LS106	24	74LS178	90
74LS108	24	74LS179	90
74LS110	24	74LS180	90
74LS112	24	74LS181	90
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74S04	38	74S127	110
74S06	45	74S128	110
74S08	65	74S129	110
74S10	45	74S130	110
74S12	55	74S131	110
74S14	55	74S132	110
74S16	55	74S133	110
74S18	55	74S134	110
74S20	55	74S135	110
74S22	55	74S136	110
74S24	55	74S137	110
74S26	55	74S138	110
74S28	55	74S139	110
74S30	55	74S140	110
74S32	55	74S141	110
74S34	55	74S142	110
74S36	55	74S143	110
74S38	55	74S144	110
74S40	55	74S145	110
74S42	55	74S146	110
74S44	55	74S147	110
74S46	55	74S148	110
74S48	55	74S149	110
74S50	55	74S150	110
74S52	55	74S151	110
74S54	55	74S152	110
74S56	55	74S153	110
74S58	55	74S154	110
74S60	55	74S155	110
74S62	55	74S156	110
74S64	55	74S157	110
74S66	55	74S158	110
74S68	55	74S159	110
74S70	55	74S160	110
74S72	55	74S161	110
74S74	55	74S162	110
74S76	55	74S163	110
74S78	55	74S164	110
74S80	55	74S165	110
74S82	55	74S166	110
74S84	55	74S167	110
74S86	55	74S168	110
74S88	55	74S169	110
74S90	55	74S170	110
74S92	55	74S171	110
74S94	55	74S172	110
74S96	55	74S173	110
74S98	55	74S174	110
74S100	55	74S175	110
74S102	55	74S176	110
74S104	55	74S177	110
74S106	55	74S178	110
74S108	55	74S179	110
74S110	55	74S180	110
74S112	55	74S181	110
74S114	55	74S182	110
74S116	55	74S183	110
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74S85	200		



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Build a Computer kit that grows with you, and can expand to 64k RAM, Microsoft BASIC, Text Editor/Assembler, Word Processor, Floppy Disks and more.

## EXPLORER/85

Here's the low cost way to learn the fundamentals of computing, the all-important basics you'll need more and more as you advance in computer skills. For just \$129.95 you get the advanced-design Explorer/85 motherboard, with all the features you need to learn how to write and use programs. And it can grow into a system that is a match for any personal computer on the market. Look at these features: 8085 Central Processing Unit, the microprocessor "heart" of the Explorer/85. (Join the millions who will buy and use the 8080/8085 this year alone). Four 8-bit plus one 6-bit input/output ports from which you can input and output your programs, as well as control exterior switches, relays, lights, etc. A cassette interface that lets you store and reload programs you've learned to write. A deluxe 2,000 byte operating system/monitor makes it easy to learn computing in several important ways. It allows simpler, faster writing and entering of programs. It permits access by you to all parts of the system so you can check on the status of any point in the program. It allows tracing each program step by step, with provision for displaying all the contents of the CPU (registers, flags, etc.) and it does much more!

You get all this in the starting level (Level A) of the Explorer/85 for only \$129.95. Incredible! To use, just plug in your AC power supply and terminal or keyboard/display — if you don't have them, see our special offers below.

Level A computer kit (Terminal Version) ... \$129.95 plus \$3 P&I\*  
Level A kit (Hex Keypad/Display Version) ... \$129.95 plus \$3 P&I\*

LEVEL B — This "building block" converts the motherboard into a two-slot S100 bus (industry standard) computer. Now you can plug in any of the hundreds of S100 cards available.  
Level B kit ... \$49.95 plus \$2 P&I\*  
S100 bus connectors (two required) ... \$4.85 each, postpaid.

LEVEL C — Add still more computing power, this "building block" mounts directly on the motherboard and expands the S100 bus to six slots.  
Level C kit ... \$39.95 plus \$2 P&I\*  
S100 bus connectors (five required) ... \$4.85 each, postpaid.

LEVEL D — When you reach the point in learning that requires more memory, we offer two choices: either add 4k of memory directly on the motherboard, or add 16k to 64k of memory by means of a single S100 card, our famous "JAWS".  
Level D kit (CHECK ONE) ... 4k on-board ... \$49.95 plus \$2 P&I\*  
16k S100 "JAWS" ... \$149.95 plus \$2 P&I\*  
32k S100 "JAWS" ... \$199.95 plus \$2 P&I\*  
64k S100 "JAWS" ... \$249.95 plus \$2 P&I\*  
64k S100 "JAWS" ... \$299.95 plus \$2 P&I\*

LEVEL E — An important "building block" that activates the 8k ROM EPROM space on the motherboard. Now just plug in our 8k MICROSOFT BASIC or your own custom programs.  
Level E kit ... \$5.95 plus 50¢ P&I\*  
MICROSOFT BASIC — It's the language that allows you to talk English to your computer! It is available three ways: 8k cassette version of Microsoft BASIC (requires Level B and 12k of RAM minimum; we suggest a 16k S100 "JAWS" — see above) ... \$54.95 plus \$2 P&I\*  
8k ROM version of Microsoft BASIC (requires Level B & Level E and 4k RAM; just plug into your Level E sockets. We suggest either the 4k Level D RAM expansion or a 16k S100 "JAWS") ... \$99.95 plus \$2 P&I\*  
Disk version of Microsoft BASIC (requires Level B, 32k of RAM, floppy disk controller, 8" floppy disk drive) ... \$325 postpaid.

TEXT EDITOR/ASSEMBLER — The editor/ assembler is a software tool (a program) designed to simplify the task of writing programs. As your programs become longer and more complex, the assembler can save you many hours of programming time. This software includes an editor program that enters the programs you write, makes changes, and saves the programs on cassettes. The assembler performs the clerical task of translating symbolic code into the computer-readable object code. The editor/ assembler program is available either in cassette or a ROM version.  
Editor/Assembler (Cassette version; requires Level "B" and 8k (min) of RAM — we suggest 16k "JAWS" — see above) ... \$58.95 plus \$2 P&I\*  
Editor/Assembler (ROM version; supplied on an S100 card; requires Level B and 4k RAM (min) — we suggest either Level D or 16k "JAWS") ... \$99.95 plus \$2 P&I\*  
8" FLOPPY DISK — A remarkable "building block" Add our 8" floppy disk when you need faster operation: more convenient program storage, perhaps a business application, and access to the literally thousands of programs and program languages available today. You simply plug them into your Explorer/85 disk system — it accepts all IBM-formatted CP/M programs.  
8" Floppy Disk Drive ... \$499.95 plus \$12 P&I\*  
Floppy Controller Card ... \$199.95 plus \$2 P&I\*  
Disk Drive Cabinet & Power Supply ... \$69.95 plus \$3 P&I\*  
Drive Cables (set up for two drives) ... \$25.00 plus \$1.50 P&I\*  
CP/M 2.2 Disk Operating System; includes Text Editor/Assembler, dynamic debugger, and other features that give your Explorer/85 access to thousands of existing CP/M-based programs. \$150.00 postpaid.

NEED A POWER SUPPLY? Consider our AP-1. It can supply all the power you need for a fully expanded Explorer/85 (note: disk drives have their own power supply). Plus the AP-1 fits neatly into the attractive Explorer steel cabinet (see below).  
AP-1 Power Supply kit (8V @ 5 amp) in deluxe steel cabinet ... \$39.95 plus \$2 P&I\*  
NEED A TERMINAL? We offer you choices: the least expensive one is our Hex Keypad/Display kit that displays the information on a calculator-type screen. The other choice is our ASCII Keyboard/Computer Terminal kit, that can be used with either

1. Plug in Netronics's Hex Keypad/Display
2. Add Level B in convert to S100
3. Add 4k RAM
4. Plug in Level E, here, or cassettes, Microsoft BASIC or Editor/Assembler in ROM
5. Add two S100 boards
6. Add your own custom programs (prototyping unit)
7. Connect terminal

a CRT monitor or a TV set (if you have an RF modulator)

Hex Keypad/Display kit ... \$69.95 plus \$2 P&I\*

FASTERM-64 TERMINAL KIT — Featuring a 56 key ASCII Keyboard, 128 character set upper and lower case, 75 ohm output, 8 baud rates, 150 to 19,200 (switch select), RS232C or 20 MA output, 32 or 64 character by 16 line formats. Complete with Deluxe Steel Cabinet and Power Supply ... \$199.95 plus \$3 P&I\*

RF Modulator kit (allows you to use your TV set as a

12" Video Monitor (10MHz bandwidth) ... \$139.95 plus \$5 P&I\*

Deluxe Steel Cabinet for the Explorer/85 ... \$49.95 plus \$3 P&I\*

Fan for cabinet ... \$15.00 plus \$1.50 P&I\*

## ORDER A SPECIAL-PRICE EXPLORER/85 PAK—THERE'S ONE FOR EVERY NEED.

Beginner Pak (Save \$26.00) — You get Level A (Terminal Version) with Monitor, Source Listing (\$25 value), AP-1 5-amp power supply, Intel 8085 Users Manual ... (Reg. \$199.95) SPECIAL \$169.95 plus \$4 P&I\*

Experimenter Pak (Save \$53.40) — You get Level A (Hex Keypad/Display Version) with Hex Keypad/Display, Intel 8085 User Manual, Level A Hex Monitor Source Listing, and AP-1 5-amp power supply ... (Reg. \$279.95) SPECIAL \$219.95 plus \$6 P&I\*

Special Microsoft BASIC Pak (Save \$103.00) — You get Levels A (Terminal Version), B, D (4k RAM), E, 8k Microsoft in ROM, Intel 8085 User Manual, Level A Monitor Source Listing, and AP-1 5-amp power supply ... (Reg. \$439.70) SPECIAL \$339.95 plus \$7 P&I\*

Add a Rom-Version Text Editor/Assembler (Requires levels B and D or S100 Memory) ... \$99.95 plus \$2 P&I\*

Starter 8" Disk System — Includes Level A, B, floppy disk controller, one CDC 8" disk-drive, two-drive cable two S100 connectors; just add your own power supplies, cabinets and hardware ... (Reg. \$1365.00) SPECIAL \$699.95 plus \$13 P&I\*  
32k Starter System ... \$1045.95 plus \$13 P&I\*  
48k Starter System ... \$1095.95 plus \$13 P&I\*  
64k Starter System ... \$1145.95 plus \$13 P&I\*  
Add to any of above Explorer steel cabinet, AP-1 5-amp power supply, Level C with two S100 connectors, disk drive cabinet and power supply, two sub-D connectors for connecting your printer and terminal ... (Reg. \$225.95) SPECIAL \$199.95 plus \$13 P&I\*

Complete 64K System, Wired & Tested ... \$1650.00 plus \$26 P&I\*  
Special Complete Business Software Pak (Save \$625.00) — Includes CP/M 2.2 Microsoft BASIC, General Ledger, Accounts Receivable, Accounts Payable, Payroll Package ... (Reg. \$3125) SPECIAL \$699.95 postpaid.

\*P&I stands for "postage & insurance." For Canadian orders, double this amount.

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NEED A POWER SUPPLY? Consider our AP-1. It can supply all the power you need for a fully expanded Explorer/85 (note: disk drives have their own power supply). Plus the AP-1 fits neatly into the attractive Explorer steel cabinet (see below).

AP-1 Power Supply kit (8V @ 5 amp) in deluxe steel cabinet ... \$39.95 plus \$2 P&I\*

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a CRT monitor or a TV set (if you have an RF modulator)

Hex Keypad/Display kit ... \$69.95 plus \$2 P&I\*

FASTERM-64 TERMINAL KIT — Featuring a 56 key ASCII Keyboard, 128 character set upper and lower case, 75 ohm output, 8 baud rates, 150 to 19,200 (switch select), RS232C or 20 MA output, 32 or 64 character by 16 line formats. Complete with Deluxe Steel Cabinet and Power Supply ... \$199.95 plus \$3 P&I\*

RF Modulator kit (allows you to use your TV set as a

12" Video Monitor (10MHz bandwidth) ... \$139.95 plus \$5 P&I\*

Deluxe Steel Cabinet for the Explorer/85 ... \$49.95 plus \$3 P&I\*

Fan for cabinet ... \$15.00 plus \$1.50 P&I\*

ORDER A SPECIAL-PRICE EXPLORER/85 PAK—THERE'S ONE FOR EVERY NEED.

Beginner Pak (Save \$26.00) — You get Level A (Terminal Version) with Monitor, Source Listing (\$25 value), AP-1 5-amp power supply, Intel 8085 Users Manual ... (Reg. \$199.95) SPECIAL \$169.95 plus \$4 P&I\*

Experimenter Pak (Save \$53.40) — You get Level A (Hex Keypad/Display Version) with Hex Keypad/Display, Intel 8085 User Manual, Level A Hex Monitor Source Listing, and AP-1 5-amp power supply ... (Reg. \$279.95) SPECIAL \$219.95 plus \$6 P&I\*

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Starter 8" Disk System — Includes Level A, B, floppy disk controller, one CDC 8" disk-drive, two-drive cable two S100 connectors; just add your own power supplies, cabinets and hardware ... (Reg. \$1365.00) SPECIAL \$699.95 plus \$13 P&I\*

# ANNOUNCING TWO NEW TERMINALS

Smart • Fast • Graphics • Matching Modem and \$295 Printer

Netronics announces a state of the art breakthrough in terminals, now at prices you can afford, you can go on-line with data-bank and computer phone-line services. It's all yours: "electronic newspapers," educational services, Dow-Jones stock reports, games, recipes, personal computing with any level language, program exchanges, electronic bulletin boards ... and more every day!!!



Netronics offers two new terminals, both feature a full 56 key/128 character typewriter-style keyboard, baud rates to 19.2 kilobaud, a rugged steel cabinet and power supply. The simplest one, FASTERM-64, is a 16 line by 64 or 32 character per line unit, with a serial printer port for making hard copy of all incoming data, and optional provisions for block and special character graphics. The "smart" version, SMARTERM-80, features either 24 line by 80 characters per line or 16 by 40 characters per line, it offers on-screen editing with page-at-a-time printing, 12,000 pixel graphics, line graphics, absolute cursor addressing, underlining, reverse video, one-half intensity and much more ... simply plug them into your computer or our phone modem and be on-line instantly. Use your TV set (RF modulator required) or our deluxe green-phosphor monitor pictured above. For hard copy just add our matched printer.

Price breakthrough!!! Own the FASTERM-64, a complete terminal kit, ready to plug in for just \$199.95 or order the SMARTERM-80 kit for just \$299.95, (both available wired and tested.) Be on-line with the million-dollar computers and data services today ... we even supply the necessary subscription forms.

More good news! All the components in our terminals are available separately (see coupon), so you buy only what you need!!!

FASTERM-64 ... DISPLAY FORMAT: 64 or 32 characters/line by 16 lines ... 96 displayable ASCII characters (upper & lower case) ... 8 baud rates: 150, 300, 600, 1200, 2400, 4800, 9600, 19,200 (switch sel.) ... LINE OUTPUT: RS232C or 20 ma current loop ... VIDEO OUTPUT: 1V PP (EIA RS-170) ... CURSOR MODES: home & clear screen, erase to end of line, erase cursor line, cursor up & down, auto carriage return/line feed at end of line & auto scrolling ... REVERSE VIDEO ... BLINKING CURSOR ... PARITY: off, even or odd ... STOP BITS: 1, 1.5, 2 ... DATA BITS PER CHARACTER: 5, 6, 7 or 8 ... CHARACTER OUTPUT: 5 by 7 dot matrix in a 7 by 12 cell ... PRINTER OUTPUT: prints all incoming data ... 1K ON BOARD RAM ... 2K ON BOARD ROM ... CRYSTAL CONTROLLED ... COMPLETE WITH POWER SUPPLY ... OPTIONAL GRAPHICS MODE: includes 34 Greek & math characters plus 30 special graphics characters ... ASCII ENCODED KEYBOARD: 56 key/128 characters.

SMARTERM-80 ... DISPLAY FORMAT: 80 characters by 24 lines or 40 characters by 16 lines 128 displayable ASCII characters (upper & lower case) 8 baud rates: 110, 300, 600, 1200, 2400, 4800, 9600, 19,200 ... LINE OUTPUT: RS232C or 20 ma current loop ... VIDEO OUTPUT: 1V PP (EIA RS-170) ... EDITING FEATURES: insert/delete line, insert/delete character, forward/back tab ... LINE OR PAGE FUNCTION ... PAGE PRINT FUNCTION ... CURSOR POSITIONING: up, down, right, left, plus absolute cursor positioning with read back ... VISUAL ATTRIBUTES: underline, blink, reverse video, half intensity, & blank ... GRAPHICS: 12,000 pixel resolution block plus line graphics ... ON-SCREEN PARITY INDICATOR ... PARITY: off, even or odd ... STOP BITS: 110 baud 2, all others 1 ... CHAR. OUTPUT: 7 by 11 character in a 9 by 12 block ... PRINTER OUTPUT ... 60 OR 50 HZ VERTICAL REFRESH ... BLINKING BLOCK CURSOR ... CRYSTAL CONTROLLED ... 2K ON BOARD RAM ... ASCII ENCODED KEYBOARD: 56 key/128 character ... 4K ON BOARD ROM ... COMPLETE WITH POWER SUPPLY.

TELEPHONE MODEM 103 O/A ... FULL DUPLEX, FCC APPROVED ... DATA RATE: 300 baud ... INTERFACE: RS232C and TTY ... CONTROLS: talk/data switch (no need to connect and disconnect phone), originate/answer switch on rear panel ... NO POWER SUPPLY REQUIRED.

ASCII KEYBOARD ASCII-3 ... 56 KEY/128 CHARACTER ASCII ENCODED, UPPER & LOWER CASE, FULLY DEBOUNCED ... 2 KEY ROLLOVER ... POS OR NEG LOGIC WITH POS STROBE ... REQUIRES +5 & -12V DC (SUPPLIED FROM VIDEO BOARDS) ... PRINTER COMET I ... SERIAL I/O TO 9600 BAUD ... CHARACTER COLUMN (132 COMPRESSED) ... 10" TRACTOR FEED ... UPPER/LOWER CASE ... INDUSTRY STANDARD RIBBONS ... 4 CHARACTER SIZES ... 9 BY 7 DOT MATRIX ... BI-DIRECTIONAL PRINTING



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Please send the items checked below:

FASTERM-64 TERMINAL (includes FASTVID-64 video board ASCII-3 keyboard, steel cabinet and power supply) ... kit \$199.95 plus \$3 P&I ... wired & tested \$249.95 plus \$3 P&I ... graphics option: add \$19.95 to each of above

COMPLETE SMARTERM-80 TERMINAL (includes SMARTVID-80 video board, ASCII-3 keyboard, steel cabinet and power supply) ... kit \$299.95 plus \$3 P&I ... wired & tested \$369.95 plus \$3 P&I

FASTVID-64 VIDEO BOARD (requires +5 & -12V DC) ... kit \$99.95 plus \$3 P&I ... graphics option add \$19.95 ... wired & tested \$129.95 plus \$3 P&I

SMARTVID-80 VIDEO BOARD (requires +5 & -12V DC) ... kit \$199.95 plus \$3 P&I ... wired & tested \$249.95 plus \$3 P&I

DELUXE STEEL TERMINAL CABINET ... \$19.95 plus \$3 P&I ... ASCII-3 KEYBOARD (requires +5 & -12VDC) ... kit \$69.95 plus \$3 P&I ... wired & tested \$89.95 plus \$3 P&I

POWER SUPPLY (powers ASCII-3 keyboard & video boards) ... kit only \$19.95 plus \$2 P&I

ZENITH VIDEO MONITOR (high resolution green phosphor) ... wired & tested \$149.95 plus \$6 P&I

TELEPHONE MODEM MODEL 103 O/A ... wired & tested \$189.95 plus \$3 P&I

DOT MATRIX PRINTER Comet I ... wired & tested \$299.95 plus \$10 P&I

RF MODULATOR MOD RF-1 ... kit only \$8.95 plus \$1 P&I

3FT-25 LEAD MODEM/TERMINAL OR PRINTER/TERMINAL CONNECTOR CABLE ... \$14.95 ea plus \$2 P&I

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## JE600 Hexadecimal Encoder Kit

FULL 8-BIT  
LATCHED OUTPUT  
19-KEY KEYBOARD



The JE600 Encoder Keyboard Kit provides two separate hexadecimal digits produced from sequential key entries to allow direct programming for 8-bit microprocessor or 8-bit memory circuits. Three additional keys are provided for user operations with one having a bistable output available. The outputs are displayed and monitored with 9 LED readouts. Also included is a key entry strobe. Features: Full 8-bit latched output for microprocessor use. Three user-definable keys with one being bistable operation. Debounce circuit provided for all 19 keys. 9 LED readouts to verify entries. Easy interfacing with standard 16-pin IC connector. Only +5VDC required for operation. Size: 3 1/2" H x 8 1/2" W x 8 1/4" D.

JE600/DTE-HK (After assembled as pictured above) ..... \$99.95

JE600 Kit (PC Board & Components (no case)) ..... \$59.95

K19 19-Key Keyboard (Keyboard only) ..... \$14.95

DTE-HK (case only - 3 1/2" H x 8 1/2" W x 8 1/4" D) ..... \$44.95

## JE610 ASCII Encoded Keyboard Kit



The JE610 ASCII Keyboard Kit can be interfaced into most any computer system. The kit comes complete with an industrial grade keyboard switch assembly (62-key), IC's, sockets, connector, electronic components and a double-sided printed wiring board. The keyboard assembly requires +5V @ 150mA and -12V @ 10 mA for operation. Features: 60 keys generate the 128 characters, upper and lower case ASCII set. Fully buffered. Two user-definable keys provided for custom applications. Caps lock for upper-case-only alpha characters. Utilizes a 2376 (40-pin) encoder-read-only memory chip. Outputs directly compatible with TTL/DTL or MOS logic arrays. Easy interfacing with 16-pin dip or 18-pin edge connector. Size: 3 1/2" H x 14 1/2" W x 8 1/4" D.

JE610/DTE-AK (After assembled as pictured above) ..... \$124.95

JE610 Kit (62-Key Keyboard, PC Board, & Components (no case)) ..... \$79.95

K62 62-Key Keyboard (Keyboard only) ..... \$34.95

DTE-AK (case only - 3 1/2" H x 14 1/2" W x 8 1/4" D) ..... \$49.95

## JE212 - Negative 12VDC Adapter Board Kit

Provides -12VDC from incoming 5VDC ..... \$9.95

## JE215 Adjustable Dual Power Supply

General Description: The JE215 is a Dual Power Supply with independent adjustable positive and negative output voltages. A separate adjustment for each of the supplies provides the user unlimited applications for IC current voltage requirements. The supply can also be used as a general all-purpose variable power supply.

- Adjustable regulated power supplies, pos. and neg. 1.2VDC to 15VDC.
- 5VDC @ 500mA, 10VDC @ 750mA, 12VDC @ 500mA, and 15VDC @ 175mA.
- Two, 3-terminal adj. IC regulators with thermal overload protection.
- Heat sink regulator cooling.
- LED "on" indicator.
- Printed Board Construction.
- 120VAC input.
- Size: 3 1/2" W x 5 1/16" L x 2 1/4" H.

JE215 Adj. Dual Power Supply Kit (as shown) ..... \$24.95

(Picture not shown but similar in construction to above)

JE200 Reg. Power Supply Kit (5VDC, 1 amp) ..... \$14.95

JE205 Adapter Bld. (to JE200) ±5 ±9 ±12V ..... \$12.95

JE210 Var. Pwr. Sply. Kit, 5-15VDC, to 1 amp ..... \$19.95

## HP-Display Sale-National

5082 Series - 0.43 Inch - 7-Segment

Part Number	Color	Description	1-3 Price	SALE PRICE
5082-7650	Hi Eff Red	CA - LHD	99	4/\$2.49
5082-7651	Hi Eff Red	CA - RHD	99	4/\$2.49
5082-7652	Hi Eff Red	CC - RHD	99	4/\$2.49
5082-7656	Hi Eff Red	Overflow ±1RHD	99	4/\$2.49
5082-7660	Yellow	CA - LHD	99	4/\$2.49
5082-7661	Yellow	CA - RHD	99	4/\$2.49
5082-7663	Yellow	CC - RHD	99	4/\$2.49
5082-7670	Green	CA - LHD	99	4/\$2.49
5082-7671	Green	CA - RHD	99	4/\$2.49
5082-7673	Green	CC - RHD	99	4/\$2.49
5082-7676	Green	Overflow ±1RHD	99	4/\$2.49
5082-7750	Red	CA - LHD	99	4/\$2.49
5082-7751	Red	CA - RHD	99	4/\$2.49
5082-7756	Red	Overflow ±1RHD	99	4/\$2.49
5082-7760	Red	CC - RHD	99	4/\$2.49

CA-Comm. Anode CC-Comm. Cathode LHD/RHD Left/right hand dec.

## Mini Stereo AM/FM Receiver

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For Joggers, Cyclists,  
Skaters & Sports Events

CLOSE-OUT!

FEATURES: Lightweight headphones. Left/right balance control. Full fidelity stereo sound. Additional black soft carrying case & shoulder strap. Belt clip (hands free). Operates on 3 AA cell batteries (not incl.). Compact size: 3 1/2" x 4 1/2" x 1 1/2". Wt. 6 oz.

Model 2830 ..... \$29.95

## KEYBOARDS — POWER SUPPLIES

### ALPS 26-KEY CALCULATOR KEYBOARD

Features: 7 Position, 3 Position and 2 Position Switches (ON/OFF). These are from Olivetti's Top of the Line. Mechanical SPST Switching: 22-pin Edge Card Connection.

Part No. KB26 ..... \$1.95 each or 2/\$3.49

### MICRO SWITCH 69-KEY KEYBOARD

Data Entry Keyboard, Encoded Output: 6-bit Parallel EBC DIC. Switching: Hall Effect, 24-pin Edge Card Connection. Complete with Pin Connector.

Part No. KB69SD12-2 (Fits into DTE-20 Enclosure) ..... \$19.95 each

### DATANETICS 74-KEY KEYBOARD

ASCI Encoded Keyboard, Output: Even Parity ASCII. Supply voltage +5, -12 volt. Switching: Mechanical SPST - 50-pin connector. Complete with Pin Connector.

Part No. KB354 (Fits into DTE-20 Enclosure) ..... \$29.95 each

### MICRO SWITCH 85-KEY KEYBOARD

Word Processing Keyboard, 26 Pin Edge Card Connection. Supply Voltage +5VDC. Main keyboard is QWERTY. Additional Key Pads for Cursor and word processing functions.

Part No. 85SD18-1 ..... \$29.95 each

### MICRO SWITCH 88-KEY KEYBOARD (PARALLEL ASCII)

Data Entry Keyboard used in a Diable 1640 Terminal. Supply Voltage: +5V, -12V. Switching: Hall Effect - 10-pin Edge Card Connection. Schematic included. Uses 8048 Encoder Chip.

Part No. 88SD22 (Fits into DTE-20 Enclosure) ..... \$69.95 each

### POWER SUPPLY - 5VDC @ 1 AMP REGULATED

Transaction Tech Output +5VDC @ 1 amp (also +30VDC). Input 115VAC 60Hz. Two-tone (black/beige) self-enclosed case. 8 ft. 3 cond. black power cord. Size: 6 1/2" W x 7 1/2" D x 2 1/4" H. Wt. 3 lbs.

Part No. PS51194 ..... \$19.95 each

### POWER SUPPLY - 5VDC @ 1 AMP REGULATED

8 Industries Output +5VDC @ 1 amp, +36-42VDC adj. 400mA or less, 30VAC (isol.) @ 1.5 amp. Input 115VAC 60Hz. Circ. brkr. reset button. Bk. self-enc. case w/4 rubber feet. 6 ft. 3 cond. blk. pow. cord. On/off switch. 8 1/2" W x 7 1/2" D x 2 1/4" H - wt. 7 lbs.

Part No. PS407D ..... \$24.95 each

### POWER SUPPLY - 5VDC @ 7.5 AMP, 12VDC @ 1.5 AMP SWITCHING

Input: 115VAC, 50-60Hz @ 3 amp/230VAC, 50Hz @ 1.5 amp. Fan volt./power supply select switch (115/230VAC). Output: 5VDC @ 7.5 amp, 12VDC @ 1.5 amp. 8 ft. blk. pow. cord. 11 1/2" W x 9 1/2" D x 3 1/2" H. Wt. 6 lbs.

Part No. PS94V0 ..... \$49.95 each

### POWER PAC - Heavy Duty Multi-Voltage Power Supply - 5VDC, 12VDC, 24VDC

Output: +5VDC @ 30A, +12VDC @ 2A, -12VDC @ 4A & +24VDC @ 3A. Input: 115VAC, 7A, 220VAC, 3.5A. Reg. ±15% line & load. Ripple: 10mV peak to peak (30V RMS). Overvolt. protect: 5V, +12V, -12V. Overcurr. protect. incl. 15% 1/2" x 7 1/2" x 7 1/2" D. Wt. 40 lbs.

Part No. 285-016 ..... \$89.95 each

## SORENSEN Regulated Power Supplies

Sorensen's open construction (SOC) power supplies are series-regulated solid-state systems, designed to provide reg. DC voltages at 6 levels (2-28 v/range). These units are open-framed on sturdy black anodized aluminum for excellent mounting.

FEATURES: 115/230/240VAC input @ 50-60Hz. Low Ripple: 1.5mVrms, 5mV P-P maximum. Adjustable current limit. Voltage adjustment control. All schematics and specifications supplied with unit. Series A,B,C,D have three mounting surfaces (Series F, bottom mounting only).

Part No.	Series	Output Voltage Adjustment Range		Output Current (Amps)		Size (inches)	Weight	Price
		50°C	60°C	50°C	60°C			
SOC-26	B	1.9	2.1	6.0	4.9	3.8	5.82 x 4.88 x 2.50	4.3 lbs. \$19.95
SOC-26	F	1.9	2.1	26.0	21.5	17.5	16.00 x 4.88 x 4.88	18 lbs. 28.95
SOC-5	A	4.75	5.25	3.0	2.4	1.8	4.50 x 4.88 x 1.82	2 lbs. 24.95
SOC-5	E	4.75	5.25	18.0	15.0	12.0	14.00 x 4.88 x 2.75	12 lbs. 29.95
SOC-5	F	4.75	5.25	26.0	21.5	17.5	16.00 x 4.88 x 4.88	18 lbs. 49.95
SOC-12	E	11.4	12.6	17.0	14.2	6.8	14.00 x 4.88 x 1.82	19 lbs. 44.95
SOC-12	F	11.4	12.6	18.0	15.0	9.5	16.00 x 4.88 x 4.88	18 lbs. 48.95
SOC-15	C	14.25	15.75	5.0	4.2	3.5	7.00 x 4.88 x 2.37	6 lbs. 26.95
SOC-15	E	14.25	15.75	6.5	5.8	6.8	14.00 x 4.88 x 1.82	12 lbs. 44.95
SOC-15	F	14.25	15.75	13.0	10.8	8.0	16.00 x 4.88 x 4.88	18 lbs. 48.95
SOC-28	B	26.4	28.4	0.8	0.4	45	4.00 x 4.88 x 1.82	2 lbs. 24.95

Part No.	Series	Output Voltage Adjustment Range		Output Current (Amps)		Size (inches)	Weight	Price
		50°C	60°C	50°C	60°C			
22A-300		-100 to +100 +7.5V to 7.5V	-200 to +200 +10.5V to 10.5V	-200 to +200 +10.5V to 10.5V	-200 to +200 +10.5V to 10.5V	2.50 x 3.00 x .98	2 oz.	\$14.95
22A-300		0.22A	1.7A	1.7A	1.7A	3.00 x 5.75 x 1.18	8 oz.	14.95
22B-200		2.2A	1.7A	1.7A	1.7A	2.75 x 5.75 x 1.18	8 oz.	19.95
22B-200		2.2A	1.7A	1.7A	1.7A	2.80 x 7.50 x 1.18	8 oz.	24.95
22C-100		6.0A	2.6A	2.6A	2.6A	2.80 x 7.50 x 1.18	8 oz.	24.95
22C-100		6.0A	2.6A	2.6A	2.6A	3.00 x 7.00 x 3.30	2 lbs.	24.95
22C-100		6.0A	2.6A	2.6A	2.6A	2.90 x 7.00 x 3.30	2 lbs.	29.95
22E-100		18.0A						

\*Voltage Adjustment Range - Current ratings apply over entire voltage range.

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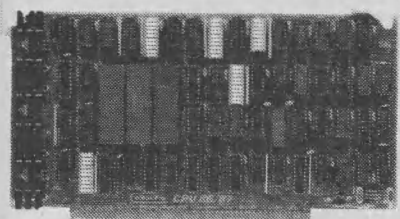
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3/6 MHz Z80B CPU with 24 Bit Addressing. FASTEST Z80 CPU AVAILABLE!

KJGBT160A	3/6 MHz A&T	\$295.00	\$225.00
KJGBT160C	3/6 MHz CSC	\$395.00	\$375.00



### DISK CONTROLLERS

#### DISK 1 FLOPPY CONTROLLER

Fast DMA, Soft Sector, Controls 8" or 5 1/4" Single or Double Density. OUR BEST!

KJP0BT171ACP	A&T w/CP/M2.2 & BIOS	\$670.00	\$450.00
KJGBT171C	CSC	\$595.00	\$555.00
KJGBTCPM80*	CP/M 2.2 for Z80/8085 with manuals & BIOS 8" S/D disk	\$175.00	
KJGBTCPM86	CP/M for 8086 with manuals & BIOS 8" S/D disk		\$300.00

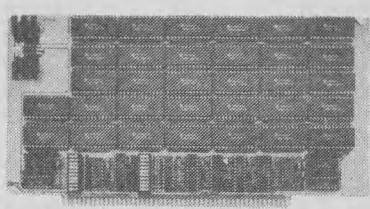
## SAVE \$220.00!!

### DISK 2/SELECTOR CHANNEL HARD DISK CONTROLLER

Fast DMA 2 board set Controls 4 Shugart 4000 series or Fujitsu 2300 type drives. Includes CP/M 2.2\*

KJGBT177A	Assembled & Tested	\$795.00	\$595.00
KJGBT177C	CSC	\$895.00	\$650.00

## SAVE \$200.00!!



### CMOS RAM SALE!

#### RAM 17 - 64K CMOS STATIC RAM

RAM 17, 12 MHz, 2 Watt, DMA Compatible 24 Bit Addressing

Part No.	Description	List Price	Our Price
KJGBT175A64	64K A&T	\$599.00	\$369.00
KJGBT175C64	64K CSC	\$750.00	\$699.00

## SAVE \$236.00!!

#### RAM 16 - 32K x 16 BIT CMOS STATIC RAM

8 and/or 16 Bit  
816 RAM 16 12 MHz, 32K x 16 or 64K x 8  
IEEE/696 16 Bit 2 Watt, 24 Bit Addressing

KJGBT180A	64K A&T	\$650.00	\$429.00
KJGBT180C	64K CSC	\$750.00	\$699.00

## SAVE \$221.00!

#### NEW! RAM 21 - 128K STATIC RAM

816 RAM 21 12MHz, 128K x 8 or 64K x 16  
IEEE/696 8 or 16 Bit 1.2 Amps, 24 Bit Addressing

KJGBT190A	128K A&T	\$1695.00	\$ 995.00
KJGBT190C	128K CSC	\$1895.00	\$1795.00

## SAVE \$700.00!!!

#### M-DRIVE SOLID STATE DISK DRIVE, 3500% FASTER!

Not Really, But the Next Best Thing for CompuPro 8085/88 Users. Call for Detail on M-Drive.

M-Drive requires a 6MHz CPU 8085/88 dual processor, Disk 1 DMA disk controller and System Support 1 Multifunction Board

KJGBTMD128KA	128K of A&T memory & M-Drive Software	\$1198.00	
KJGBTMD128KC	128K of CSC memory & M-Drive Software	\$1398.00	
KJGBTMD256KA	256K of A&T memory & M-Drive Software	\$2395.00	
KJGBTMD256KC	256K of CSC memory & M-Drive Software	\$2795.00	

### STATIC MEMORY BOARDS

#### RAM 20 - 32K STATIC RAM

RAM 20 10 MHz, 4K byte block disable, bank select or 24 bit addressing available 8, 16, 24 or 32K

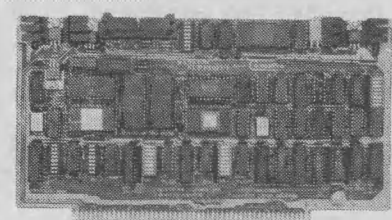
KJGBT164A8	8K A&T	\$210.00	\$190.00
KJGBT164A8C	8K CSC	\$280.00	\$260.00
KJGBT164A16	16K A&T	\$285.00	\$260.00
KJGBT164A16C	16K CSC	\$355.00	\$325.00
KJGBT164A24	24K A&T	\$355.00	\$325.00
KJGBT164A24C	24K CSC	\$425.00	\$385.00
KJGBT164A32	32K A&T	\$425.00	\$295.00
KJGBT164A32C	32K CSC	\$495.00	\$450.00



### S-100 MAINFRAME

110V 60Hz CVT Mainframe uses famous 20 slot COMPUPRO Motherboard. (55 lbs.)

KJGBTENC20RM	20 Slot Rackmount	\$895.00	\$760.00
KJGBTENC20DK	20 Slot Desk Top	\$825.00	\$699.00



### I/O BOARDS

#### SYSTEM SUPPORT 1 MULTIFUNCTION BOARD

Serial port (software prog. baud), 4K EPROM or RAM provision, 15 levels of interrupt, real time clock, optional math processor

Part No.	Description	List Price	Our Price
KJGBT162A	Assembled & Tested	\$399.00	\$295.00
KJGBT162C	CSC	\$495.00	\$460.00
KJGBT8231	Math Chip		\$195.00
KJGBT8232	Math Chip		\$195.00
KJGBT162AM1	A&T with 8231 Math Chip		\$490.00
KJGBT162CM1	CSC w/8231 Math Chip		\$655.00
KJGBT162AM2	A&T w/8232 Math Chip		\$490.00
KJGBT162CM2	CSC w/8232 Math Chip		\$655.00

## SAVE \$100.00!!

### MPX CHANNEL BOARD

I/O Multiplexer, using 8085A-2 CPU on board with 4K RAM

KJGBT166A4	Assembled & Tested	\$495.00	\$395.00
KJGBT166C4	CSC	\$595.00	\$475.00

With 16K RAM

KJGBT166A16	Assembled & Tested	\$649.00	\$525.00
KJGBT166C16	CSC	\$749.00	\$649.00

### INTERFACER 1

Two Serial I/O

KJGBT133A	Assembled & Tested	\$249.00	\$199.95
KJGBT133C	CSC	\$324.00	\$298.00

### INTERFACER 2

Three parallel, one serial I/O board

KJGBT150A	Assembled & Tested	\$249.00	\$199.95
KJGBT150C	CSC	\$324.00	\$298.00

### INTERFACER 3

Eight channel multi-use serial I/O board

KJGBT1748A	Assembled & Tested	\$699.00	\$469.00
KJGBT1748C	CSC 200 hr. 8 Port	\$849.00	\$750.00
KJGBT1745A	Assembled & Tested	\$599.00	\$399.00
KJGBT1745C	CSC 200hr. 5 port	\$699.00	\$629.00

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KJGBT187A	Assembled & Tested	\$350.00	\$315.00
KJGBT187C	CSC	\$450.00	\$415.00

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Color Graphics board with Parallel I/O

KJGBT144A	Assembled & Tested	\$399.00	\$249.00
KJGBT144C	CSC	\$449.00	\$339.00
KJGBT2D	Sublogic Universal Graphics Interpreter Software		\$35.00

## SAVE \$150.00!

### S-100 MOTHERBOARDS

Active termination, 6-12-20 Slot

KJGBT153A	A&T 6 slot, 2 lbs.	\$140.00	\$125.00
KJGBT153C	CSC 6 slot, 2 lbs.	\$190.00	\$175.00
KJGBT154A	A&T 12 slot, 3 lbs.	\$175.00	\$155.00
KJGBT154C	CSC 12 slot, 3 lbs.	\$240.00	\$220.00
KJGBT155A	A&T 20 slot, 4 lbs.	\$265.00	\$235.00
KJGBT155C	CSC 20 slot, 4 lbs.	\$340.00	\$310.00

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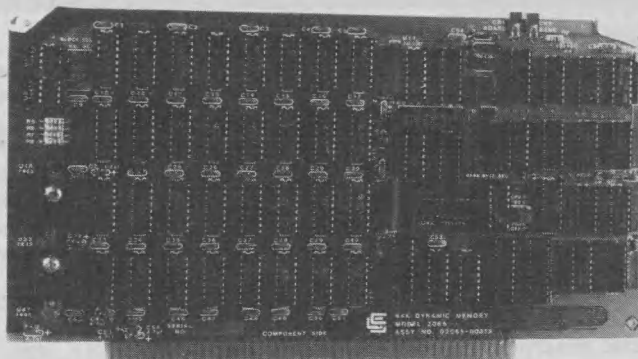
Circle 277 on Reader Service card.

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1  
ONE



### 64K IEEE-S100 DYNAMIC MEMORY CARD



- 2 or 4 MHz operation
- Designed to IEEE proposed S-100 bus standards
- Supports IMSAI-type front panels
- Operates with either an 8080 or Z-80 based S-100 system providing processor-transparent refreshes with both
- Bank-select system allows system memory expansion
- Bank-select port-s address is jumper selectable
- Any 16K block can be made bank-independent

**KJCCS20653**

SHIPPING WEIGHT 2 lbs.

LIST PRICE: \$350.00

SAVE \$130.00!!

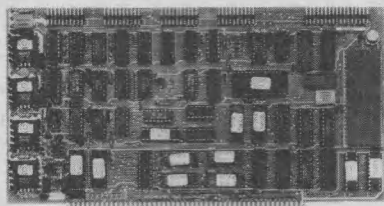
- All 64K can be made bank-enabled on power-on & reset
- Fully buffered address and data lines
- Configuration as a 16K, 32K, or 48K board without the removal of RAMs
- Fail-safe refresh circuitry for extended Wait States
- Board configuration with reliable easy-to-configure Berg jumpers
- Supports DMA
- Jumper-selectable Phantom input

- Uses Popular 4116 RAMs
- Assembled & tested
- All ICs in sockets
- Full Factory Warranty

**SAVE  
\$130.00!!**

**\$249.00 ea or 4/\$880.00**

## 5Mb S-100 HARD DISK SUB-SYSTEM \$1495.00 5Mb S-100 HARD DISK BACK-UP \$1100.00\*



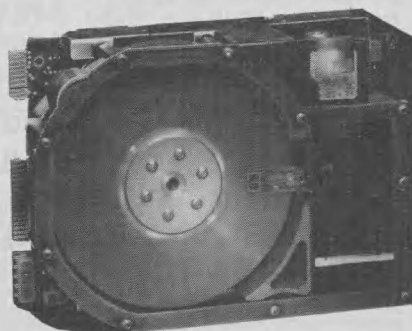
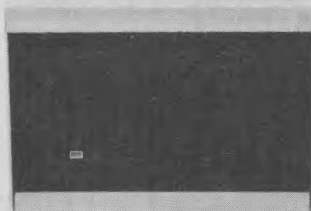
**MORROW  
DESIGNS**



Winchester speed, 5Mb capacity and reliability for only \$1495.00! The DISCUS M5 from Morrow Designs includes a 5Mb Seagate ST506 Winchester drive installed in a cabinet with cables and power supply, a DMA hard disk controller, CP/M® 2.2 operating system and Microsoft's BASIC programming language. Sounds too good to be true? There's more... a 5Mb add-on drive for additional storage or back-up is only \$1100.00. It's faster and more reliable than tape and costs less!

#### KEY FEATURES:

- Storage capacity of 6.38Mb unformatted; 5.0Mb formatted
- Band actuator and stepper motor head positioning
- 5.0 megabit/second transfer rate
- Same track capacity as a double density 8 inch floppy
- 170 millisecond random average access time, reduceable to 95 ms via a simple software algorithm
- The only single S-100 DMA Hard disk controller board on the market today
- Fully compatible with high speed 6MHz and 8MHz CPUs of today and tomorrow
- DMA bus arbitration as outlined by the IEEE 696 standard
- Controls 1 to 4 soft sectored Winchester drives
- ST506 or SA 1000 interface compatible
- Variable sector length (256,512,1024, or 2048 byte sectors)
- Automatic CRC generation and checking
- Addresses 1 to 16 heads
- Addresses an infinite number of tracks
- Contains its own on-board microprocessor — Signetics 8X300
- 24-bit address burst DMA transfers
- Channel driven for enhanced speed
- All disk driver routines resident on the controller
- Variable format
- No buffering required
- Maximum transfer rate 5,000,000 bits per second
- Due to this high transfer rate, a minimum CPU speed of 2.5MHz is required



The DMAHDC has been designed for expansion. One to four drives can be attached directly and controlled. One to sixteen drive heads may be addressed. Any number of tracks may be specified during the seek routine by specifying one to two hundred and fifty-six tracks one or more times. Each of the expansion abilities prepare the user to upgrade his system as technology advances to additional platters and tracks.

#### DISCUS M5 WITH DMA HARD DISK CONTROLLER

**KJMDSMAM5**

Software supplied on 8" IBM3740 disk with blank I/O and INSTALL program

**KJMDSMAM52B**

Software configured for Morrow DJ/2B controller and Mult I/O as console

**KJMDSMAM5DMA**

Software configured for Morrow DJ/DMA controller and Mult I/O as console

**KJMDSMAM55S**

Software supplied on 5 1/4" soft sector (IBM/Cromemco disk w/blank I/O and INSTALL program

**KJMDSMAM5NS**

Software supplied on 5 1/4" 10 sector North Star disk with blank I/O and INSTALL program

**DISCUS M5**

5Mb Subsystem

List Price \$2195.00

**SALE PRICE \$1495.00**

(order by part numbers listed above; shipping weight 17 lbs.)

#### DISCUS M5 ADD-ON DRIVE

**MDSADM5**

5Mb Add-On Drive

List Price \$1845.00

**SALE PRICE \$1100.00\***

\*With purchase of above M5 subsystem or with previous purchase of M5 subsystem from Priority One Electronics. Proof of prior M5 purchase required with order.

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1



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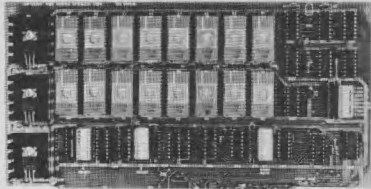
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## 32K S-100 EPROM CARD

**NEW!**



**\$79.95**  
KIT

USES 2716's

Blank PC Board - \$34

ASSEMBLED & TESTED  
ADD \$30

**SPECIAL: 2716 EPROM's (450 NS) Are \$9.95 Ea. With Above Kit.**

### KIT FEATURES:

1. Uses +5V only 2716 (2Kx8) EPROM's.
2. Allows up to 32K of software on line!
3. IEEE S-100 Compatible.
4. Addressable as two independent 16K blocks.
5. Cromemco extended or Northstar bank select.
6. On board wait state circuitry if needed.
7. Any or all EPROM locations can be disabled.
8. Double sided PC board, solder-masked, silk-screened.
9. Gold plated contact fingers
10. Unselected EPROM's automatically powered down for low power.
11. Fully buffered and bypassed.
12. Easy and quick to assemble.

## 64K S100 STATIC RAM

**\$349<sup>00</sup>**  
KIT

**NEW!**

LOW POWER!

RAM OR EPROM!

BLANK PC BOARD  
WITH DOCUMENTATION  
\$55

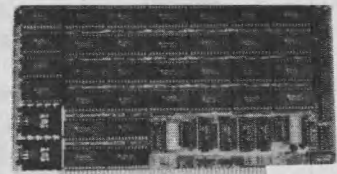
SUPPORT IC's + CAPS  
\$17.50

FULL SOCKET SET  
\$14.50

FULLY SUPPORTS THE  
NEW IEEE 696 S100  
STANDARD  
(AS PROPOSED)

FOR 56K KIT \$299

ASSEMBLED AND  
TESTED ADD \$40



### FEATURES:

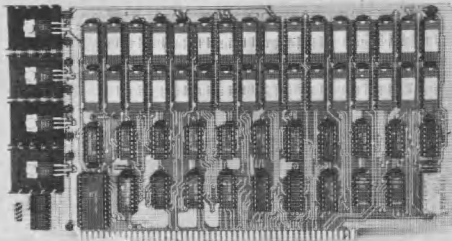
- \* Uses new 2K x 8 (TMM 2016 or HM 6116) RAMs.
- \* Fully supports IEEE 696 24 BIT Extended Addressing.
- \* 64K draws only approximately 500 MA.
- \* 200 NS RAMs are standard. (TOSHIBA makes TMM 2016s as fast as 100 NS. FOR YOUR HIGH SPEED APPLICATIONS.)
- \* SUPPORTS PHANTOM (BOTH LOWER 32K AND ENTIRE BOARD).
- \* 2716 EPROMs may be installed in any of top 48K.
- \* Any of the top 8K (E000 H AND ABOVE) may be disabled to provide windows to eliminate any possible conflicts with your system monitor, disk controller, etc.
- \* Perfect for small systems since BOTH RAM and EPROM may co-exist on the same board.
- \* BOARD may be partially populated as 56K.

## 16K STATIC RAM KIT-S 100 BUSS

PRICE CUT!

**\$149<sup>95</sup>**  
KIT

FOR 4MHZ  
ADD \$10



### KIT FEATURES:

1. Addressable as four separate 4K Blocks.
2. ON BOARD BANK SELECT circuitry (Cromemco Standard) Allows up to 512K on line!
3. Uses 2714 (450NS) 4K Static Rams.
4. ON BOARD SELECTABLE WAIT STATES.
5. Double sided PC Board, with solder mask and silk screened layout. Gold plated contact fingers
6. All address and data lines fully buffered.
7. Kit includes ALL parts and sockets.
8. PHANTOM is jumpered to PIN 67.
9. LOW POWER: under 1.5 amps TYPICAL from the +8 Volt Buss
10. Blank PC Board can be populated as any multiple of 4K.

BLANK PC BOARD W/DATA-\$33

LOW PROFILE SOCKET SET-\$12

SUPPORT IC'S & CAPS-\$19.95

ASSEMBLED & TESTED-ADD \$35

**OUR #1 SELLING  
RAM BOARD!**

## 64K SS-50 STATIC RAM

**\$259<sup>00</sup>**  
(48K KIT)

**NEW!**

LOW POWER!

RAM OR EPROM!

BLANK PC BOARD  
WITH  
DOCUMENTATION  
\$52

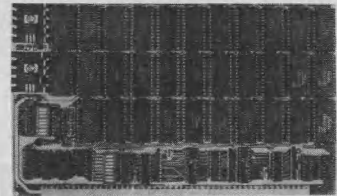
SUPPORT IC's + CAPS  
\$18.00

FULL SOCKET SET  
\$15.00

56K Kit \$309

64K Kit \$359

ASSEMBLED AND  
TESTED ADD \$40



### FEATURES:

- \* Uses new 2K x 8 (TMM 2016 or HM 6116) RAMs.
- \* Fully supports Extended Addressing.
- \* 64K draws only approximately 500 MA.
- \* 200 NS RAMs are standard. (TOSHIBA makes TMM 2016s as fast as 100 NS. FOR YOUR HIGH SPEED APPLICATIONS.)
- \* Board is configured as 3-16K blocks and 8-2K blocks (within any 64K block) for maximum flexibility.
- \* 2716 EPROMs may be installed anywhere on Board.
- \* Top 16K may be disabled in 2K blocks to avoid any I/O conflicts.
- \* One Board supports both RAM and EPROM.
- \* RAM supports 2MHZ operation at no extra charge!
- \* Board may be partially populated in 16K increments.

## STEREO! S-100 SOUND COMPUTER BOARD

**NEW!**

At last, an S-100 Board that unleashes the full power of two unbelievable General Instruments AY3-8910 NMOS computer sound IC's. Allows you under total computer control to generate an infinite number of special sound effects for games or any other program. Sounds can be called in BASIC, ASSEMBLY LANGUAGE, etc.

### KIT FEATURES:

- \* TWO GI SOUND COMPUTER IC'S.
- \* FOUR PARALLEL I/O PORTS ON BOARD.
- \* USES ON BOARD AUDIO AMPS OR YOUR STEREO.
- \* ON BOARD PROTO TYPING AREA.
- \* ALL SOCKETS, PARTS AND HARDWARE ARE INCLUDED.
- \* PC BOARD IS SOLDERMASKED, SILK SCREENED, WITH GOLD CONTACTS.
- \* EASY, QUICK, AND FUN TO BUILD. WITH FULL INSTRUCTIONS.
- \* USES PROGRAMMED I/O FOR MAXIMUM SYSTEM FLEXIBILITY.

Both Basic and Assembly Language Programming examples are included.

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SCL™ is now available! Our Sound Command Language makes writing Sound Effects programs a SNAP! SCL™ also includes routines for Register-Examine-Modify, Memory-Examine-Modify, and Play-Memory. SCL™ is available on CP/M™ compatible diskette or 2708 or 2716. Diskette - \$24.95 2708 - \$19.95 2716 - \$29.95. Diskette includes the source. EPROM'S are ORG at E000H. (Diskette is 8 Inch Soft Sectors)

### COMPLETE KIT!

**\$84<sup>95</sup>**

(WITH DATA MANUAL)

BLANK PC  
BOARD W/DATA  
\$31

## SPECIAL PURCHASE!

## UART SALE!

TR1602B - SAME AS TMS6011,  
AY5-1013, ETC. 40 PIN DIP

**TR1602B**

**\$2<sup>95</sup>**  
EACH

**4 For \$10<sup>00</sup>**

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SPECIAL OFFER: **\$14.95** each Add \$3 for 60 page Data Manual.

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# CLUB NOTES

## Berkshire User's Group

Berkshire User's Group (Atari) meets the second Saturday of each month in Great Barrington, MA. The organization now has a support group for owners of Atari 400 and 800 personal computers.

For further information, contact J. J. Brown, Coordinator, BUG (A), PO Box 593, Great Barrington, MA 01230. 413-528-0744.

## Pomona Heath User's Group

Heath User's Group (H.U.G.) meets the fourth Thursday of every month at the Heathkit Electronic Center, Pomona, CA. at 7:30 PM. For more information, write to H. Friedman, H.U.G., 1555 N. Orange Grove Ave., Pomona, CA 91767.

## Big Red Apple Club

Twenty-five states are represented in the Big Red Apple Club, a national organization for people who live too far from an Apple club to participate. Club business is conducted through "The Scarlet Letter," a monthly newsletter.

For more information, contact John Wrenholt, B.R.A.C., 1301 North 19th St., Norfolk, NE 68701. 402-379-3531.

## VIC-20 User's Club

The VIC-20 User's Club, recently formed in Wichita, KS, meets once a month to exchange news and public domain programs. For information on meeting times and a copy of the club's newsletter, contact Walter Lounsbury, 739 Litchfield, Wichita, KS 67203. 316-262-4861.

## InterCalc

InterCalc is a group focusing on the uses of VisiCalc-type programs. The organization also publishes "Spreadsheet," a bimonthly newsletter. Information is available by writing to InterCalc, PO Box 254, Scarsdale, NY 10583.

## Central Ohio Osborne User's Group

The Central Ohio Osborne User's Group meets the second Monday of every month at the Ohio Institute of Technology in Columbus. Correspondence should be addressed to Newton Brokaw, Secretary, C.O.O.U.G., 2695 Donna Drive, Columbus, OH 43220. 614-457-5716.

## Original Apple III

The Original Apple III club meets on the third Wednesday of every month at the Board Room of the California Bar Association, 555 Franklin St., San Francisco. The group publishes the "Open Apple Gazette," a newsletter devoted to Apple III users.

For more information, contact Original Apple III, PO Box 813, San Francisco, CA 94101.

## Philadelphia Area Computer Society

Users of Apple, Atari, CP/M, IBM, Ohio Scientific, Pascal, PET and TRS-80 are invited to Philadelphia Area Computer Society meetings, which take place on the third Saturday of every month. Memberships include a subscription to the "Data Bus" monthly newsletter.

For further information, write to P.A.C.S., PO Box 1954, Philadelphia, PA 19105.

## Association for Computer-Chip Experimenters

A one-hour tutorial precedes each monthly meeting of the Association for Computer-Chip Experimenters. The meetings take place on the second Tuesday of every month (September through June) at Sheridan College in Oakville, Ontario.

For more information, write to A.C.E., c/o M. E. Franklin, 690 Laurier Ave., Milton, Ontario L9T 4R5.

## The Aurora Computer Society

The Aurora Computer Society, a non-profit computer club not geared toward any specific computer system or processor, meets on the second Wednesday of each month. The club concentrates on developing an understanding of the uses of computers in society.

For further information, contact T.A.C.S., PO Box 9558, South Edmonton, Alberta T6E 5X2.

## The Long Island Computer Association

The Long Island Computer Association meets the third Friday of each month at 8 PM in room 508, building 500, The New York Institute of Technology, Old Westbury Campus, Hicksville, NY.

For more information, write to L.I.C.A., PO Box 71, Hicksville, NY 11802.

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Used Heath H-8 memory board, I/O card, terminal, software and complete H-8 system. Ten to 50 percent off list price. Send for free listing. D. Wong, Box 406, Groton Fall, NY 10519.

Digital Group Boards: 1 standard mother-board @ \$50; 3 8K memory boards @ \$85 each; 1 Z-80 CPU board @ \$80; 1 TV 64 cassette/CRT board @ \$80; 1 keyboard and enclosure @ \$40; 1 phi-deck controller @ \$80; 1 parallel I/O board @ \$30; 1 I/O prototype board @ \$5. Software on cassettes with manuals @ \$15 each; Expander Printer 10 C.P.S., with parallel interface @ \$150; or \$800 for everything. All items assembled and in good working condition, with manuals. Must sell. Paul Teseny, 17 DeKalb Place, Morristown, NJ 07960. 201-539-6876.

For sale: CCS \$100 boards, Disk cont. (2422) \$225. 64K 5MHZ (2065) \$250, Z80 (2810) \$180. 32K static 5 MHZ (2032) \$250. Shahir 408-238-2969, 2666 Paganini Ave., S.J. CA 95122.

Drastically reduced: Heath H-19, Gimix 6800/6809 full business and development system, 80K RAM, 5 disks, SSB cont., 8K PROM RDR, 2-PROM PGMR, all I/O slots, special cabinets, lots of bus, and dev. software. Over \$10K invested, less than 100 hrs. on. First \$3500 takes all. Call Tom, 313-471-2810.

For sale: genuine Radio Shack Level II ROMs, \$100. Signalman modem \$90, 16K Level II computer, \$500. Contact Frank Weatherford, Rt. 12, Hidaway Hill #36, Gray, TN 37615. 615-477-7202.

Complete 68000 system with 32K RAM, 16K monitor, parallel printer port, timer, cassette tape I/O, and auxiliary RS-232 port contained in an H-19 professional terminal. Monitor includes a single-line assembler-disassembler along with a host of normal commands including a help command. Can operate the H-19 and aux. port in transparent mode. Excellent condition with all manuals only \$1750. R. L. Riggs, 2865 Akron, East Point, GA 30344.

For sale: SWTPC MF-68 dual mini-floppy, \$500; MP-16A, MP-16X, PR-40, \$150 each; MP-A2, \$60; MP-A, Universal bare MB, \$40 each; MP-M 4K (5), MP-R, Newtech music board, \$30 each; MP-S (3), MP-C, MP-LA, AC-30, CIS-30+, \$25 each; Elektra cabinet w/ power supply, \$300; CREI 6802 microcomputer, \$200; *Microcomputing* issues 1-68, \$120. Dick Efnor, 4446 Chase Park, Annandale, VA 22003; 703-256-1197.

ZX-81 USERS: "Z-WEST" is offering free software in our special mini-issue newsletter. Write now to get your complimentary copy. P.O. Box 2411, Vista, CA 92083.

For sale: Heath H-89 w/single 5 1/4" floppy & H-14 printer, best offer. Xerox dual 8" SS disk drives, new, \$1395. Sencore CB-42 analyst, best offer. Sams CB-1 through CB-125, best offer. Heathkit SB-300 and SB-401 complete w/manuals, best offer. Stan Stevens, RR4, Box 26, Iowa City, IA 52240. 319-354-9726.



# CONVERSIONS "I"

Fred J. Gunther (9464 Wandering Way, Columbia, MD 21045) has translated into Applesoft Basic and Apple II graphics the Atari Lissajous curve plotting program published in the June 1982 issue of *Microcomputing* (see "Atari Gets Serious," p. 118). The author notes that the translation uses the Apple II hi-res page 1, so that the input parameters are displayed with the figure. Original line numbers and variable names were retained to aid comparisons. The author reset the keyboard strobe (POKE-16368,0) after checking to see if any key had been depressed (line 120). Minor changes involve initialization of variable "t" (line 30), combining print and input statements (lines 40, 60, 80 and 100), a change in the screen limits (line 84) and changes in the color selection and plotting statements (lines 120, 130 and 150).

## LIST

```

1 REM LISSAJ.PLOTTER BY TED MC FADDEN T.Q.R.
4 REM
5 REM TRANSLATED TO APPLESOFT BY DR. FRED J. GUNTHER
6 REM
20 HGR : VTAB 24
30 LET T = 0
40 INPUT "X:AMP, OMEGA, PHASE ";AX,WX,PX
60 INPUT "Y:AMP, OMEGA, PHASE ";AY,WY,PY
72 LET CX = 140:CY = 80: REM SCREEN CENTER
80 INPUT "SCALE = ";S
82 IF S * AX > CX THEN LET S = CX / AX
84 IF S * AX + CX > 279 THEN LET S = (279 - CX) / AX
86 IF S * AY > CY THEN LET S = CY / AY
88 IF S * AY + CY > 159 THEN LET S = (159 - CY) / AY
100 INPUT "STEP = ";T1
110 POKE - 16368,0
120 HCOLOR= 3
130 HPLLOT S * AX * COS (PX) + CX,CY - S * AY * COS (PY)
140 LET T = T + T1
150 HPLLOT TO S * AX * COS (WX * T + PX) + CX,CY - S * AY * COS (WY * T
    + PY)
160 LET IX = PEEK ( - 16384): POKE - 16368,0: IF IX < 127 THEN GOTO 14
    0
180 INPUT "READY FOR NEXT ONE? ";A$
190 IF A$ = "" THEN GOTO 40
200 IF A$ = "Y" OR A$ = "YES" THEN GOTO 20
210 END
    
```

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## MICRO QUIZ

(from page 15)

Answer: 30

J	K	2 <sup>k</sup> + J	X
1	1	3	3
1	2	5	8
2	1	4	12
2	2	6	18
3	1	5	23
3	2	7	30

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## Fall Conference of Classroom Applications

Computer-Using Educators' third annual Fall Conference of Classroom Application of Computers is scheduled for October 1 and 2 in San Jose, CA.

The schedule includes exhibits as well as workshops and six hour-long sessions covering computer-related classroom activities. Curriculum topics will include all levels of education from preschool through post-secondary.

For more information concerning membership in Computer-Using Educators or the conference, contact Don McKell, Conference Coordinator, Computer-Using Educators, PO Box 18547, San Jose, CA 95158.

## ACM-IEEE Fifteenth Annual Workshop on Microprogramming

The Fifteenth Annual Workshop on Microprogramming (MICRO-15), jointly sponsored by ACM, SIGMICRO and IEEE TC-MICRO, is planned for October 5-7 in Palo Alto, CA.

A tutorial covering current issues in firmware engineering will be presented on the preceding day (October 4) by Dr. Ted Lewis.

For more information, contact Dr. Joseph Fisher, MICRO-15 Program Chairman, Yale University, Box 2158, Yale Station, New Haven, CT 06520.

## Computer Show, Electronics Flea Market

A Computer Show and Electronics Flea Market will take place October 8 and 9 in Virginia Beach, VA. The two-day event is in conjunction with the Virginia State ARRL Amateur Radio Convention and Hamfest. It will include a large indoor flea market for the selling of computer and electronics parts. In addition, dealers, forums and displays will be featured.

Information, tickets and reservations for flea market tables or commercial booths are available from Jim Harrison, 1234 Little Bay Ave., Norfolk, VA 23503. 804-587-1695.

## NECOM 82

NECOM 82, a single source computer show featuring the industry's newest developments, is planned for October 12 in Newton, MA.

The one-day, regional format show will take place from 1-7 PM at the Boston Marriott Hotel on Commonwealth Avenue in Newton.

For more information on NECOM 82, contact Norm DeNardi Enterprises, 289 S. San Antonio Road, Suite 204, Los Altos, CA 94022. 415-941-8440.

## ARE Meeting and ICAP Workshop

The nineteenth Annual Review of Electronics (ARE) and the Illinois Computer Affiliates Program (ICAP) workshop are scheduled for October 13 and 14 at the University of Illinois at Urbana-Champaign.

The ARE meeting and ICAP workshop will be devoted to highlights in physical electronics and computer-related research conducted by the University of Illinois at Urbana-Champaign in the departments of electrical engineering, computer science and the coordinated science laboratory.

For more information, contact Dr. M. E. Krasnow, University of Illinois, College of Engineering, 1308 West Green St., Urbana, IL 61801. 217-333-3836.

## Small Computers in the Arts

The second Symposium on Small Computers in the Arts will feature tutorials, hands-on workshops and demonstrations from October 15-17 in Philadelphia, PA. The three-day event will also include films and paper presentations dealing with the use of small computers as tools in arts such as music, graphics and animation. A computer art gallery and store, a video bar reception and several exhibits are also planned.

The Fifth Annual Philadelphia Computer Music Concert will headline the October 16 events.

The symposium is sponsored by the IEEE Computer Society and the IEEE Philadelphia Section, and is being organized by the Personal Computer Arts Group.

For further information, contact Symposium on Small Computers in the Arts, Box 1954, Philadelphia, PA 19105, or call the IEEE office at 215-243-8106.

## PerCompAsia 82

The first Southeast Asian personal computer hardware and software show will be held October 20-23 at the Hyatt Convention Center in Singapore.

For further information, contact Overseas Exhibition Services Ltd., 11 Manchester Square, London, W1M5AB, England. Telephone: 01-486 1951, Telex: 24591 Mondtex.

## EdCom 82

The National Computer Conference and Expo for Educators will take place October 21-24 at the L.A. Convention Center.

EdCom 82 will feature more than 200 seminars, workshops, demonstrations and exhibits, and computers for in-depth tutorials and hands-on sessions.

For more information, contact Jayne LaFountain, EdCom 82, 2629 N. Scottsdale Road, Scottsdale, AZ 85257.

## Pacific Northwest Computer Graphics Conference

The University of Oregon will sponsor its first Pacific Northwest Computer Graphics Conference on October 25 and 26. The conference will provide a multi-disciplinary view of computer graphics through presentations addressing research and development applications, exhibitions of prepared works and vendor displays.

Disciplines and professions that will be represented include landscape architecture, land planning, architecture, the sciences, medicine, business, graphic design and communications and education.

Researchers and practitioners are invited to exhibit drawings, slides, photos and video selections.

For further information, contact Pacific Northwest Computer Graphics Conference, Office of University Relations, 111 Susan Campbell Hall, University of Oregon, Eugene, OR 97403-1204. 503-686-5555.



## Alberta Computer Show

The Calgary and Edmonton sections of the Canadian Information Processing Society (CIPA) will pool resources with Toronto-based Whitstet Publishing Ltd. to stage Canada's first province-wide technology conference—the Alberta Computer Show.

The conference, slated for October 27 and 28 at the Calgary Convention Centre, will focus on microcomputers and graphics. For more information, contact Marilyn Harris at 403-261-5903.

## UCSD Pascal Users

The UCSD Pascal System User's Society has planned its semi-annual national meeting for October 29–31 at the Harvey House Hotel in Dallas, TX.

The meeting will feature technical presentations, an expert user panel, software exchange, hardware and software demonstrations and special interest group meetings. In addition, two tutorials will be offered free to the public.

Advance registration is \$25, payable to U.S.U.S. Meeting Committee, PO Box 1148, La Jolla, CA 92038. For further information, contact Tom Siep, U.S.U.S. Program Chairman, Texas Instruments, Dallas, TX. 214-995-0618.

## Enterprise Information Systems, Inc.

The fall forum of Enterprise Information Systems, Inc. is scheduled for November 1–3 in Palm Springs, FL. The program will focus on planning for integration of personal microcomputers, large-scale systems, data base management, office systems and telecommunications.

For more information, write to E.I.S., PO Box 1154, Greenwich, CT 06830.

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# CONVERSIONS "II"

## Color Code Combo for the PET

In the February 1982 issue of *Microcomputing* (p. 108), R. Daniel Bishop presented an excellent game for the Apple and TRS-80 computers; unfortunately, we PET owners weren't represented. Herewith, then, I present Color Code Combo for the PET. The program will run on any 8K or larger PET, and is insensitive to the Basic ROM version in use.

Bishop's Color Code Combo was a well thought-out program. My changes were, for the most part, limited to those needed to make the program run on the PET; the basic logic and display format of the program were unchanged.

**Walter Novinger  
33 Ray St.  
Schenectady, NY 12309**

*Program listing. Color Code Combo converted for the PET. Microcomputing welcomes and encourages such conversions (for the Apple, Atari, Commodore, Heath, IBM, Sinclair, ...) of programs that appear in the magazine.*

```

50 rem          ADAPTED FOR PET BY W. NOVINGER
60 rem
70 rem          33 RAY ST. SCHENECTADY, NY 12309
80 rem
90 soto520
100 rem
110 rem *** DELAY LOOP SUBROUTINE ***
120 For=1to999:next:return
130 rem
140 rem *** FLASHING CURSOR ROUTINE ***
150 rem
160 ifCR$=B$thenCR$="":soto180
170 CR$=B$
180 CC$=CR$:sotob1270
190 ForI=1to15
200 :setA$:ifA$=""then250
210 :ifAsc(A$)=13then250
220 :if(TF=0)and((A$<"0")or(A$>"9"))then250
230 :if(TF=1)and((A$<"A")or(A$>"Z"))then250
240 :A=val(A$):I=15:F1=1
250 :next
260 ifF1<>1then160
270 F1=0:return
280 rem
290 rem *** DISPLAY FORMATTING ROUTINE ***
300 rem
310 Print"[clr]"
320 Print" CHOICES"spc(15)----CORRECT-----"
330 Printspc(23)"COLORS PLACEMENT"
340 Print" [rvs]R[off] RED [G] [S]"
350 Print" [rvs]O[off] ORANGE [G] [S]"
360 Print" [rvs]Y[off] YELLOW [G] [S]"
370 Print" [rvs]G[off] GREEN [G] [S]"
380 Print" [rvs]B[off] BLUE [G] [S]"
390 Print" [rvs]P[off] PURPLE [G] [S]"
400 Print" [rvs]W[off] WHITE [G] [S]"
410 Print" [rvs]V[off] VIOLET [G] [S]"
420 ForI=1to4:Printspc(13)"[G] [S]"next
430 return
440 rem
450 rem *** OPTIONS LISTING ROUTINE ***
460 rem
470 CC$="PRESS [rvs]X[off] FOR CORRECTION":X=3:Y=18:sotob1270
480 CC$=" OR [rvs]E[off] TO ENTER GUESS":X=3:Y=20:sotob1270:B$="":X=28:soto1
60
490 rem
500 rem *** MAIN PROGRAM LISTING ***
510 rem
520 X=rd(-TI):Print"[clr]":Printspc(8)"[rvs]** COLOR CODE COMBO **[off]":Print
:Print:Print
530 Printspc(8)"(C) 1981 BY D.BISHOP":Print
540 Print" (PET VERSION BY W. NOVINGER)"
550 TF=0
560 Print:Print:Print"HOW MANY COLORS (3-8)? ";
570 X=25:Y=11:B$="":sotob160:CC$=A$:sotob1270:C=A
580 if(C<3)or(C>8)thenPrint"[up][up]":soto560
590 Print:Print:Print"HOW LARGE A TABLEAU (3-8)? ";
600 X=28:Y=13:sotob160:CC$=A$:sotob1270:T=A
610 if(T<3)or(T>8)thenPrint"[up][up]":soto590
620 Print:Print:Print"HOW MANY GUESSES (4-12)? ";
630 X=27:Y=15:sotob160:CC$=A$:sotob1270:G1=A:ifG1>1thenG=G1:soto650
640 X=28:sotob160:CC$=A$:sotob1270:G2=A:G=10*G1+G2
650 if(G<4)or(G>12)thenPrint"[up][up]":soto620
660 TF=1
670 rem
680 rem *** RANDOM PROBLEM GENERATOR ***
690 rem
700 data"R","O","Y","G","B","P","W","U"
710 ForI=1to8:readA$(I):next
720 restore
730 R$="":ForI=1toT
740 J=int(rnd(TI)*100):if(J>C)or(J<1)then740

```

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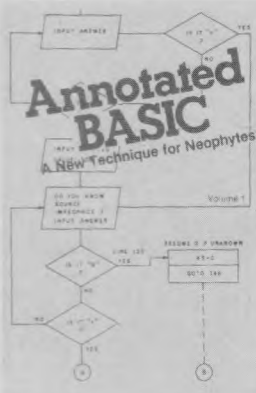
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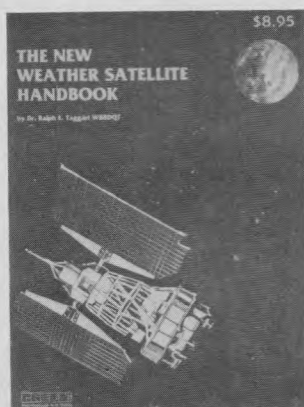
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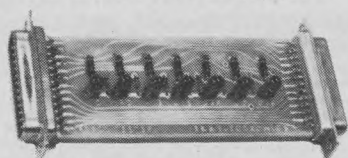
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```

750 R=R+A$(J):next
760 rem
770 rem *** SETUP DISPLAY ***
780 rem
790 gosub 310
800 X=2:IF C<>8 then Y=1:CC$="":For J=1 to 8-C:gosub 1270:Y=Y+1:next
810 X=1:Y=4:For J=1 to G:CC$="#"+right$(str$(J),2):gosub 1270:Y=Y+1:next
820 rem
830 rem *** OBTAIN PLAYER'S GUESS ***
840 rem
850 For K=1 to G
860 :G$=""
870 :For L=1 to T
880 :X=14+L:Y=3+K:gosub 160:CC$=A$:gosub 1270
890 :G$=G$+A$
900 :next L
910 :gosub 470
920 :CC$="":gosub 1270
930 :if A$="X" then 860
940 :if A$<>"E" then 910
950 :gosub 1030
960 :CC$=right$(str$(CC),2)+" "+right$(str$(CP),2):X=26:Y=K+3:gosub 1270
970 :if C=T then 1190
980 :next K
990 goto 1200
1000 rem
1010 rem *** SUBROUTINE TO EVALUATE GUESS ***
1020 rem
1030 RT=R$:G$=left$(G$,T):CP=0
1040 For I=1 to T
1050 :if mid$(G$,I,1)=mid$(R$,I,1) then CP=CP+1
1060 :next I
1070 J=0:CC=0
1080 For I=1 to T
1090 :J=J+1
1100 :if mid$(G$,I,1)<>mid$(R$,J,1) then 1120
1110 :CC=CC+1:R$=left$(R$,J-1)+" "+right$(R$,T-J):goto 1130
1120 :if J<T then 1090
1130 :J=0
1140 :next I
1150 RS=R$:R$=RT$:return
1160 rem
1170 rem *** CONCLUDING MESSAGE ***
1180 rem
1190 X=2:Y=22:CC$="CONGRATULATIONS! THAT'S IT!":gosub 1270:goto 1220
1200 X=2:Y=22:CC$="SORRY, YOU'RE OUT OF TURNS!":gosub 1270
1210 X=4:Y=23:CC$="THE CODE WAS: [rvs]+R$+[off]":gosub 1270
1220 TF=2:X=4:Y=24:CC$="PRESS ANY KEY TO GO ON":gosub 1270:X=27:gosub 160
1230 goto 520
1240 rem
1250 rem *** PRINT CC$ AT X,Y COORDINATES ***
1260 rem
1270 print "[home]";
1280 if X=1 then 1300
1290 For I=1 to X-1:print "[rt]";:next I
1300 if Y=1 then 1320
1310 For I=1 to Y-1:print "[dn]";:next I
1320 print CC$:return
1330 end

```

## Notes on TRS-80 to PET Conversions

The TRS-80 statement `PRINT@nn` (where `nn` is a screen cell) has no analog in PET Basic; my subroutine in lines 1270 through 1320 is used to emulate this function. Upon entry to the routine, the character (or string) to be printed is expected to be contained in the variable `CC$`, and the screen location for the (first) character to be printed is contained in variables `X` and `Y`. `Y` is the row number (1 is the top row, 24 the bottom row) and `X` is the character position within the `Y` row (1 at the left, 40 at the right).

Because PET's `For...Next` loops are always at least one trip, the tests in lines 1280 and 1300 are necessary; other than these tests, no range testing is done in the interest of speed.

A word of warning is in order: Printing a character at location 40,25 (lower rightmost) will cause scrolling of the screen. To print at 40,25 use `"POKE ASC(char),33767"` instead.

Another TRS-80 function emulated is associated with the random number generator. `RANDOMIZE` is emulated on the PET by the statement `X=RND(-TI)` in line 520; this seeds the generator with the current value of the PET's jiffy counter.

In addition, since the PET's `RND` function always returns a number in the range `0<RND(n)≤1` (the TRS-80 returns `1≤RND(n)≤n`), the iterative procedure of line 740 is necessary to avoid a `SUBSCRIPT OUT OF RANGE` error on array `AS`. Personally, I think the TRS-80 approach makes more sense!

The final TRS-80 feature to be emulated is the `INKEY$` function used to fetch a single character without a return. Since the PET has the `GET` function, this is not too difficult; this has been done in lines 160 through 270. As those



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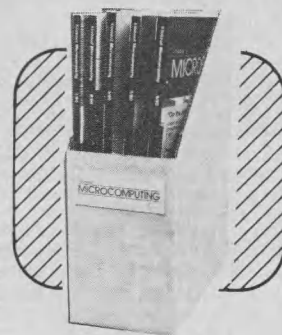
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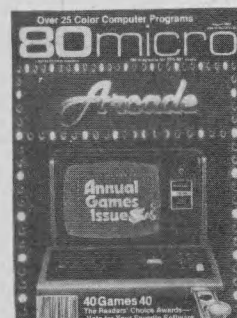
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who are familiar with the PET will remember, the GET function returns regardless of whether or not a key was pressed (hence the test for a null string in line 200).

While the replacement of INKEY\$ with GET was all that was necessary to duplicate the functionality of Mr. Bishop's program, I took the liberty of making some enhancements to the user interface.

In the event of invalid input, you should be immediately notified of the error and new input requested. The types of input Color Code Combo requires fall into three classes—numeric (the initial setup screen), alphabetic (the body of the program) and "anything goes" (line 1220). The input routine, therefore, accepts only one of these classes of characters based upon the current value of variable TF (Type\_Flag).

TF=0 allows numeric data only. TF=1 allows alphabetic data only and TF=2 (actually any other value) allows all characters (except return). TF is set appropriately in lines 550, 660 and 1220. If you wanted to really restrict input to only those characters representing the colors in the chosen set, a more restrictive test could have been made in line 230 at the cost of reduced speed.

The other user-oriented change made was done to avoid a problem common to many menu-driven programs. If there is one thing I resent, it is being sent clear back to the beginning of a menu due to simple finger problems near the end of the menu. The computer is good at making decisions and taking appropriate actions if you tell it to; lines 580, 610 and 650 reflect this philosophy.

Rather than making you repeat otherwise valid input, the PET program merely erases the bad input line, on-the-spot, and re-prompts for the desired input, repeating the process until valid input is obtained. Using this approach requires only a small incremental effort on the programmer's part.

I have used a pretty printer program I wrote to prepare Basic listings. My printer won't print the PET graphics and cursor control characters, so Pretty Printer substitutes bracket abbreviations for the cursor controls (e.g., [up] for cursor-up). Shifted characters (graphics) are shown as the unshifted character enclosed in brackets. For instance the symbol [6] in line 340 is read as shift-6. While this approach may not be as elegant as the Commodore printer, at least all the characters are shown.

As a readability enhancement, Pretty Printer also lists all Basic keywords in lowercase. Doing this makes listings clearer, especially when an expression such as FORI=STOPSTEPS is entered without spaces to speed typing and conserve memory. Pretty Printer lists this expression as "forI=StoPstepS", clearly differentiating between keywords and variable names.

Pretty Printer is appended to the program to be listed using either the TOOLKIT APPEND command or the method outlined in the Nov. 1979 *Microcomputing* "PET-pourri" (p. 191). Pretty Print is small (1400 bytes, 40 lines) and may be left permanently attached to the host program through the development process.

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# Standard 16-Bit Operating System Ideas for Using VisiCalc All About Your Atari An Alternative to Micros

## Using the Unix System

Richard Gauthier  
Reston Publishing Company, Inc., 1981  
11480 Sunset Hills Rd.  
Reston, VA 22090  
Paperback or cloth cover, 200 pp., \$18.95

*Using the Unix System* is one of what I expect to be hundreds of books that will be written about Unix in the next few years.

Unix is an operating system developed at Bell Laboratories as a personal project, but because it offered capabilities that were needed in the software development environment it grew into a product. It is sold both directly by Bell Labs and by companies licensed by Bell Labs to sell executable copies to end users. Both Venix, by Venturcom, Inc., and Xenix, by Microsoft Corporation, are examples of Unix systems that have been modified and then resold.

The reason all this matters is that it's very likely that Unix and its derivatives will become the standard operating system for 16-bit micros. It can offer a substantial base of commercially developed and debugged software now, whereas any new operating system would start out with no applications software. Because of this it would take many years and millions of dollars for a new operating system to offer all that Unix can offer today.

*Using the Unix System* is written for someone who has no knowledge of Unix or other computer operating systems. It deals with the basics of logging onto the system, using ED, the line-oriented text editor, to create, edit and search through files. It presents the basics of the Unix file system and covers the utility commands that are essential in order to look at the file system and manipulate files. The book also deals with some of the capabilities of the shell, which is the command interpreter for Unix.

The book also talks about the responsibility of the system administrator (the person responsible for ensuring that the file system has not been corrupted) and

shows how to perform most of the administrative tasks. Most of the Unix commands, along with brief descriptions of the syntax required to use them, are listed in an appendix.

I have two criticisms of the book. The first is that *Using the Unix System* probably will have a short useful life for the purchaser. Even though the information that's presented is detailed, showing every possible error and what to do about it, you may have hundreds of other questions the book doesn't address.

If you have the same experience learning to use Unix that I had, then you'll probably bumble around with a problem for months before you discover a direct solution.

For example, "grep" is a sophisticated pattern-matching program. It gets only two pages of description in Gauthier's book, so its usefulness is not obvious; you'll need a guide to get you involved with its capabilities.

My second criticism is that Gauthier makes some statements that cause you to develop the wrong idea about how Unix actually works. Some of the things that are simply conventional are stated as absolute. Other statements are actually incorrect.

For example, Gauthier writes "mv is like cp except the old file is deleted." Well, mv is the move (or rename) utility and cp is the copy utility. Cp always copies the file. Mv only changes the file name in the directory if both the source and destination file are on the same physical device.

This difference could mislead a serious user and cause him to implement a system in an inefficient manner. The author may have been better off not even mentioning the similarity of the two programs.

Still, *Using the Unix System* offers a worthwhile introduction to Unix for someone inexperienced in computer use. If you want to know the basics of Unix, or find yourself in a position where you have access to Unix but no documentation, then this book will get you started. But once you know the basics, plan on get-

ting some further documentation.

**Phil Hughes**  
Mercer Island, WA

## VisiCalc Home and Office Companion

David M. Castlewitz,  
Lawrence Chisauksy  
and Patricia Kronberg  
Osborne/McGraw-Hill, 1982  
630 Bancroft Way  
Berkeley, CA  
Paperback, 182 pp., \$15.99

Once you've used a microcomputer enough to feel comfortable with disk operating systems and elementary Basic programming, a tool like VisiCalc is easy to master and a fascinating implementation of computer technology. Creating worksheets, or templates as they are commonly called, is a simple matter after your second or third VisiCalc work session.

What may be a little more difficult is coming up with good ideas for which templates can then be created. Or, coming up with the correct mathematical formulation to implement that good idea.

When you reach such an impasse, a book like *VisiCalc Home and Office Companion* comes in handy. Here, in just 182 pages, are 50 VisiCalc templates to do things like figure the start-up costs for a new business, maintain a stock portfolio, produce survey results or even figure out how much paint you'd need to paint a room.

These templates are presented with both a sample printout, including data, and a listing of the contents of each individual grid location. All listings were generated with an Epson MX-80 dot matrix printer. The grid location listing is provided in column order—all the A column entries first, then the B column entries and so on.

You can type in the templates from the grid location list, save them on a disk and then use them with your own data. Or, you can make modifications to suit your own needs once the initial form has been



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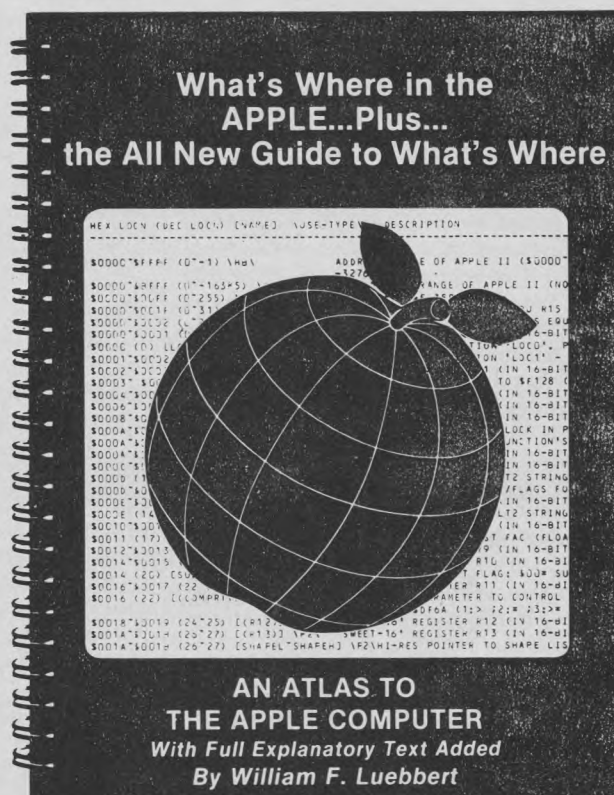
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Each template is accompanied by a one- to seven-paragraph explanation of the methodology behind the template and any special instructions on how to use it. Often, the authors provide an example or two of how the template can be most useful.

The 50 templates in the book are divided into seven categories: Loans and Investments, General Business, Inventory Control, Advertising and Sales, Personnel and Departments, Personal Finance and Household Aids. The templates will work with versions of VisiCalc designed to run on Apple, TRS-80, Commodore and IBM microcomputers. With some modification, the templates will also be usable with the SuperCalc program.

Few people will use every one of the 50 programs in this book. Everyone, however, will likely find anywhere from five to 15 of the templates to be directly applicable to their situation and another two or three that will give them a good idea for the creation of a hybrid template.

For example, I found the Professional Services Fee Analysis and Time Sheet templates to be useful in consulting work. I used the Home Inventory and Personal Possessions Evaluation to catalog my household goods and the Business Start-up Worksheet to help me evaluate the feasibility of going into business for myself. (I'm wavering.) There are several other templates that I may use as my needs change.

The target audience for a book like this more than likely is that group of VisiCalc users who are not really good at coming up with their own template ideas but can use an idea that they've seen implemented elsewhere. For this group, *VisiCalc Home and Office Companion* effectively targets that need.

**G. Michael Vose**  
Technical Editor  
Microcomputing

## **Your Atari Computer (A Guide to Atari 400/800 Personal Computers)**

Lon Poole with Martin McNiff  
and Steven Cook  
Osborne/McGraw-Hill, 1982  
630 Bancroft Way  
Berkeley, CA 94710  
Softcover, 458 pp., \$15.

Up until now, one of the biggest problems with Atari has been its lack of a really comprehensive "training manual." The operator's manual furnished with the machine is laid out in dictionary fashion, consisting of rather terse explanations of Basic keywords and functions. As a result, the owner of a new Atari is forced into spending endless hours of experimentation and, after months of effort, may succeed in "reinventing the wheel."

Fortunately, this problem has been

largely eliminated by the publication of *Your Atari Computer*, a fast-moving and well-written book from Osborne/McGraw-Hill (with more than a little technical assistance from Atari, we suspect).

The book starts out assuming you know nothing about computers: the first two chapters are of the "this is the on-off switch, this is the cartridge slot" variety. The next chapter is a brief but well-executed introduction to Basic, and by chapter 4 (surprisingly) we get into such advanced programming techniques as right-justified and decimal-aligned output, input masks, cursor control and an excellent error-handling routine. Instead of using unrelated examples for each topic, the material is presented in such a manner that the sample programs build on each other. The end product is a library of useful subroutines.

Chapters 5, 6 and 7 cover peripheral devices extensively and include first-rate explanations of cassette data files, a subject that has been completely overlooked by Atari and almost everyone else. (I am beginning to suspect that Atari has a mental block against cassettes. Their *Technical User's Notes* contains only one or two sentences on the program recorder and the *Assembler/Editor* manual scarcely more.)

Chapters 8 and 9 do a good job of covering the various Atari graphic methods, building up to an explanation of player/missile graphics. Chapter 10 covers sound, and the final chapter is a dictionary/summary of Basic keywords, operators and functions that I find much easier to use than the operator's manual. The book is rounded out with the obligatory appendices of error statements, ATASCII codes and memory organization, including some rather arcane addresses (did you know that poking a 6 or 7 into 755 causes every character on the screen to be printed upside down?).

*Your Atari Computer* is well thought-out and easy to follow, but the real surprise is that it is of almost equal value whether you are a rank novice or a veteran of innumerable midnight campaigns. It serves equally well as a textbook or a reference work, and should be standard equipment with every new Atari. Other than being overpriced (a problem endemic to computer books), the only serious criticism I have is that it does move rather quickly through beginning Basic. A supplementary text (such as the programmed *Atari Basic*, supplied by Atari as standard equipment) might be of considerable use here.

One other improvement I would like to see: detailed explanations of the Atari error codes, including a list of all the things you could have done wrong. My experience has been that some of the error messages are triggered by errors completely unrelated to what the code actually says (error 9 is the prime offender). Contrary to what most books (including this one)

say, errors 138, 140 and 143 are rarely caused by faulty cassettes or machinery, but instead are almost always due to starting at the wrong spot on the tape.

**Bill Lukerth**  
Martinez, CA

## **Using Programmable Calculators for Business**

C. Louis Hohenstein  
John Wiley & Sons, Inc., 1981  
605 Third Ave.  
New York, NY 10158  
Paperback, 256 pp., \$9.95

Maybe your business doesn't need a microcomputer.

At the risk of being branded as a heretic, I'd like to propose an alternative. If your business is saddled with repetitive tasks that require a number of sequential arithmetic steps, then you should consider the message delivered in *Using Programmable Calculators for Business*.

C. Louis Hohenstein makes a good case for programmables in this softbound book from John Wiley & Sons, Inc. After all, calculators like Hewlett-Packard's HP-38C or Texas Instruments' TI-59 cost less than most microcomputers and they're compact and can be mastered quickly.

No, you can't do your mailing list on one, nor will a programmable calculator allow you to play Asteroids or Space Invaders in four colors. But what about making depreciation calculations or adding up time card totals? These are two of the book's 17 annotated examples. In many cases you can complete chores with a programmable calculator in less time than it takes to turn on your microcomputer and load in the appropriate software.

Still not convinced? Consider the fact that *Using Programmable Calculators for Business* includes a collection of software for the TI-59. If these listings don't satisfy your needs then you can avail yourself of the book's easy-to-understand tutorial on universal programming techniques. And if that option fails you can consult the tips for finding outside suppliers of calculator software.

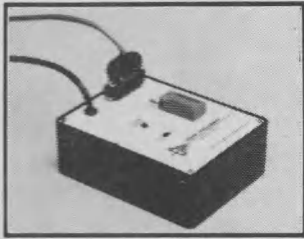
The author approaches his subject with the attitude, "I assume you are simply interested in doing a better job in less time and at a lower cost, thereby increasing your income and profit..." This practical orientation makes the strongest argument for using a programmable calculator.

Maybe you really do need a microcomputer. But you may need a programmable calculator too. If so, the basic, everyday approach of *Using Programmable Calculators for Business* should prove helpful.

**Timothy Daniel**  
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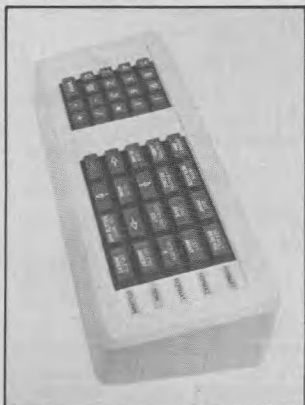
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## VisiCalc Keyboard

Key Wiz is an Apple II-compatible keyboard comprising 20 VisiCalc function keys and a 19-key numeric keypad. The function keys are used with the shift key to produce 30 VisiCalc commands. Each command key representing a particular VisiCalc code causes Key Wiz to transmit from one to four characters to the Apple. Also included are four arrow keys to position the cursor. Installation is simple, and will not interfere with



Creative Computers' Key Wiz Apple-compatible keyboard for use with VisiCalc.

other peripherals. Price is \$299.

Creative Computers, 1044 Lacey Road, Forked River, NJ 08731. Reader Service number 483.

## Mean Green Screen

Leading Edge Products, Inc., 225 Turnpike St., Canton, MA 02021, offers a 12-inch green-screen monitor for \$99. The Mean Green monitor boasts a composite video signal and display format of 1920 characters (80 char. x 24 lines). Reader Service number 482.

## An Electronic Notebook

A notebook-size computer that runs on internal batteries for up to 50 hours, with power and features comparable to many desk-top computers, has been introduced by Epson America, Inc., 3415 Kashiwa St., Torrance, CA 90505. The HX-20's programmable random-access memory is 16K bytes standard, expandable to 32K; ROM is 32K standard, expandable to 64K with an optional expansion unit. The computer includes RS-232 and serial interfaces, full-size keyboard, built-in printer with bit-addressable

graphics, liquid-crystal display screen and tone generation. The HX-20 uses a complete extended version of Microsoft Basic and has internal time, date and alarm string functions. Optional interfaces include a bar code reader, audio cassette and systems bus for further expansion. Price is \$795. Reader Service number 479.

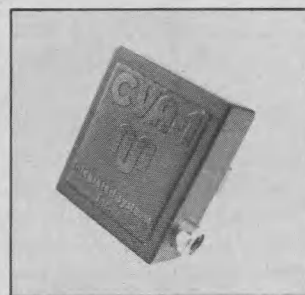
## High-Density I/O and Timer Board

The OB68K230 is a high-capacity parallel input/output and timer board with a large on-board prototyping area. It is compatible with most eight-bit and 16-bit microprocessors operating on the Multibus/IEEE 796 bus, and features four Motorola PI/T chips. The OB68K230's user-definable prototyping area will accommodate customer front-end circuits; once a wire-wrapped prototype is verified in operation, the design can be sent to Omnibyte for incorporation into the customer's production boards. Price for the OB68K230 is \$450.

Omnibyte Corp., 245 W. Roosevelt Road, Building 1, Unit 5, West Chicago, IL 60185. Reader Service number 478.



Epson's new HX-20 portable computer.



The CVA-1 video adapter from NJN Integrated Systems.

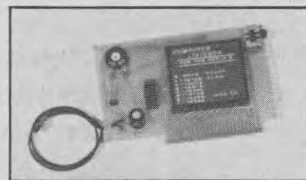
## Adapter for Osborne

If you replace the Osborne-1's external video plug with a CVA-1 composite video adapter, you can use any standard monitor with the computer. Half-intensity display enhancement (as used with WordStar) is retained, and the integral Osborne monitor remains operational. The CVA-1 can be used with more than one monitor simultaneously. Price for the adapter is \$34.95.

NJN Integrated Systems, Inc., 125 Sharon Ave., Houghton, MI 49931. Reader Service number 480.

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#### IBM PC

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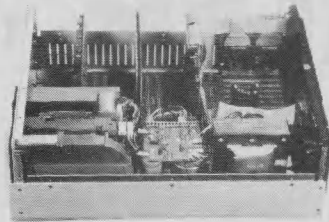




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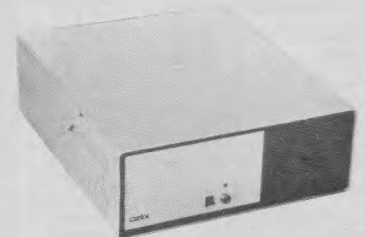
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played through the Apple's built-in speaker. The device can be used as a diagnostic tool to debug software and hardware problems; as a teaching aid to enable students to envision the internal activity; or as a novelty to give arcade-like sound to your programs. It plugs into any slot. Price is \$79.

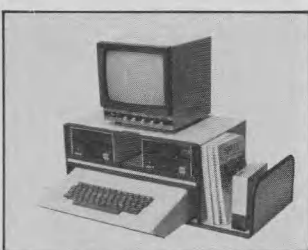
M. Reinhart Engineering Co., 4730 W. Addison, Chicago, IL 60641. Reader Service number 476.

### RGB for Apple II

Video Marketing, Inc., 780 Lorraine Drive, Box 339, Warrenton, PA 18976, offers a video board for the Apple II computer that provides red, green, blue and composite sync signals for use with an RGB video monitor. Displays of color graphics or text are improved with this board, according to the company. The board can be used with an 80-column Videx card. It plugs into slot 7; modifications are not required. Price is \$179. Reader Service number 469.

### Atari Mass Storage

Corvus Systems, Inc., 2029 O'Toole Ave., San Jose, CA 95131, has announced Winchester disk systems and the Corvus Multiplexer local area network for Atari 800 microcomputers. Corvus will also offer its Mirror backup system. Prices of Corvus disk systems start at \$3195. The Corvus Multiplexer allows up to 64 Atari computers to share disk storage and peripherals at a cost of about \$250 per computer. Reader Service number 477.



The Pro-Tech locking stand from Segull Enterprises.

### Apple Security

The quick removal of Apple peripheral cards from I/O slots makes them an easy target for thieves. Pro-Tech locking stand secures the Apple, up to three disk drives and any type or size monitor. Made of 16 gauge steel, the unit is a functional organizer and bookcase. Model BH is compatible with the Bell & Howell Apple. Price for Pro-Tech locking stand is \$145.

Segull Enterprises, 11 Cove Avenue, Berkley, MA 02780. Reader Service number 471.

### Low-End Disk

The Hobbyist 5 1/4-inch hard disk subsystem provides 5 megabytes of storage capacity for your Apple or IBM Personal Computer. The Hobbyist's \$1995 price also includes a controller, host adapter, operating software, cable, cabinet and operating instructions.

Santa Clara Systems, Inc., 560 Division St., Campbell, CA 95008. Reader Service number 473.

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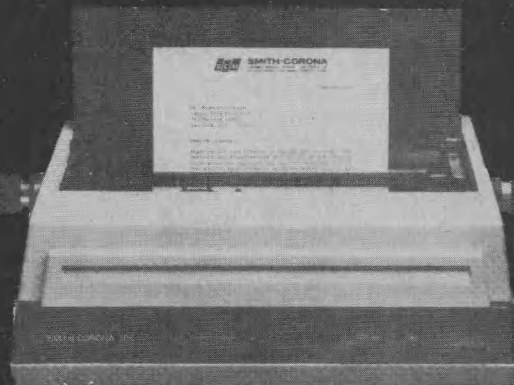
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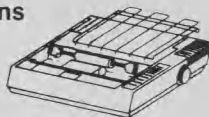
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HP-75 portable gives you computer power in a briefcase.

desk-top use, has been introduced by Hewlett-Packard, 1820 Embarcadero Road, Palo Alto, CA 94303. The HP-75 features Basic language programmability and software such as electronic spreadsheet analysis and graphics presentations. Its small size and battery-powered nonvolatile memory make it truly portable.

Three plug-in ports accept 8K or 16K ROM modules to customize the computer for specific applications. With three 16K plug-in modules, the 48K built-in operating system and 24K bytes of user memory, the HP-75's maximum memory is 120K bytes. A 32-character liquid-crystal display serves as a movable

window on a 96-character line. The HP-75 comes with a built-in Hewlett-Packard Interface Loop (HP-IL), which lets it communicate with other computers and peripherals. Price is \$995. Reader Service number 475.

### Portable Computer

The Courier Z-80 computer features 64K bytes RAM, a nine-inch CRT, detachable sculptured keyboard, 3½-inch Sony MicroFloppy disks and the CP/M operating system. An eight-slot card cage permits full expansion of this portable; compatibility with STD bus enables you to add a modem, more memory, graphics or even new CPU cards as they become avail-



The Courier computer from Jonos, Ltd.



able. Cost is \$3995.

Jonos, Ltd., 920-C E. Orangethorpe, Anaheim, CA 92801. Reader Service number 472.

## Personal Computer Network

FileServer is a Z-80A-based microprocessor through which up to 32 CP/M-oriented computer systems can access up to 80M bytes of data from any one of eight Winchester disk drives. The FileServer includes 64K bytes of RAM and 4K of ROM, its own operating system using parts of CP/M, dual Winchester drives and four network connections. Price is \$6500.

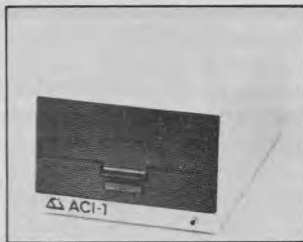
Keybrook Business Systems, Inc., 2035 National Ave., Hayward, CA 94545. Reader Service number 474.

## H/Z-89 Utility Board

A multifunction utility board for the Heath H-89, Zenith Z-89/Z-90 or Magnolia Microsystems Z-89 is offered by FBE Research Company, Inc., PO Box 68234, Seattle, WA 98168. The H89UTI Utility Card adds capability to your H/Z-89 by replacing the standard serial I/O board. It includes a quartz crystal controlled clock/calendar, bidirectional eight-bit parallel I/O and HDOS and CP/M support software; price is \$159.95. Additional options include a high-speed math processor, your choice of battery backup systems and two serial ports (chips and cable for modem and printer). Reader Service number 468.

## Networking Computer

A multiuser hard disk system for small and medium-size businesses is available from Alspa Computer, Inc., 300 Harvey West Blvd., Santa Cruz, CA 95060. The ACI Constellation system is based on the Corvus hard disk. Alspa's implementation reduces disk accesses by up to 75 percent, thus increasing overall operating speed. From one to eight users can share storage on a common disk. To configure a system, the user must purchase a Corvus multiplexer, cables and a Corvus hard disk drive; the hardware interface is standard in Alspa computers. Required



The basic ACI-1 multiuser computer from Alspa.

Constellation software is available from Alspa. Prices start at \$1995 for a basic, single-sided, double-density drive unit. Reader Service number 470.

## VIC-20 Upgrade

The Arfon Micro VIC-20 Expansion Chassis lets you expand your VIC-20 microcomputer to its full potential. The aluminum chassis includes seven expansion slots, a large power supply and a detachable cover to protect cartridges. Computer memory can be fully implemented, and a variety of peripherals can be interfaced through the chassis. All VIC-20 cartridges are supported.

Arfon Microelectronics, Ltd., 111 Rena Drive, Lafayette, LA 70503. Reader Service number 466.

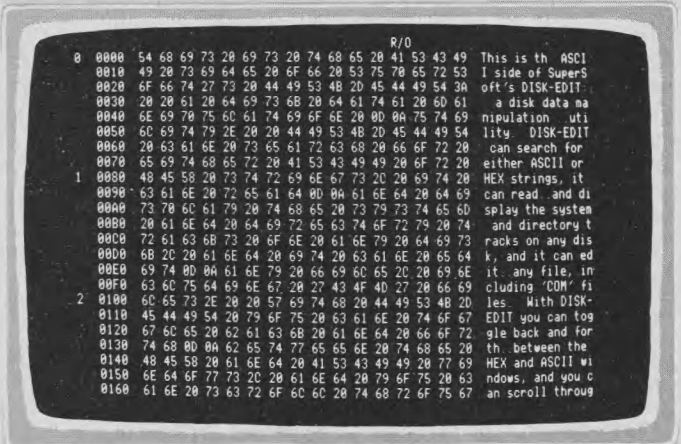
## Apple-Compatible

Basic, Inc., 5435 Scotts Valley Drive, Scotts Valley, CA 95066, announces availability of their Basis 108 microcomputer in the U.S. This system features both 6502 and Z-80 microprocessors and 64K bytes of RAM (expandable to 128K). The 108 is compatible with software and peripherals developed for use with the Apple II system.

Basis 108 is equipped with a detached keyboard and provision for two 5¼-inch floppy drives in the CPU housing. The keyboard has a full-function typewriter key set, numeric keypad, cursor block and user-definable special-function keys. The unit can generate 40- or 80-column display, color graphics and separate outputs for black-and-white, NTSC composite color and analog RGB video. Both parallel and RS-232C serial I/O are standard. Base price is \$1949. Reader Service number 467.

# Disk-Edit

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Disk-Edit provides you with ALL the raw information on your disk in both HEX and ASCII. You can scroll through that information and alter it using a set of text editing commands. You can move back and forth between HEX and ASCII windows. You can alter either the HEX or the ASCII representations of data or text. You can search for strings in either HEX or ASCII, and you have access to every bit of information on your disk.

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## Osborne-1 Data Communications

Ozmosis is a software program designed to transfer both text and binary files to or from the Osborne and another CP/M-based computer. It includes full menu prompting, autostart/stop, error recovery and troubleshooting guidelines. Ozmosis also works with modems and includes a remote terminal routine for using the Osborne as a stand-in terminal for the other computer. The Ozmosis data comm program includes two disks, an operations manual and a communications cable. Price is \$150.

Acquis Data, Inc., 17192 Gillette, Irvine, CA 92714. Reader Service number 487.

## VisiCalc Templates

The Pearformance Measurement System is a set of VisiCalc templates for measuring the rate of return of investment portfolios. The central feature of the new system is that it calculates the true internal rate of return of a portfolio for short periods of time. These returns are then used to calculate the portfolio's total time-weighted rate of return. Monthly market values and daily contributions and withdrawals for a full year can be entered on a single VisiCalc spreadsheet; users can then print out rates of return from the same spreadsheet, with popular market indices and report titles added as appropriate. Pearformance is available for a 48K Apple with a single disk drive; the user must have the VisiCalc program. Price is \$100.

Pear Systems Corp., 27 Briar Brae Road, Stamford, CT 06903. Reader Service number 488.

## VIC-20 Database

An inexpensive database manager for the VIC-20 computer is available from Micro-

Spec Ltd., 2905 Ports O'Call Court, Plano, TX 75075. The Data Manager lets the user define and manage a comprehensive system of files. The system menu includes create, add, delete, change, browse, search and print options. It stores up to 1200 records on a disk. A minimum of 8K bytes free memory is required to operate. Data Manager costs \$59.95. Reader Service number 486.

## Micros Make Maps

Now microcomputer users can have access to cartographic functions that were previously available only on mainframe systems. Micromap II makes colored and textured area maps, contour maps, 3-D polyhedron or proportional circle maps, as well as statistical charts and graphs and perspective views of digital terrain models. Micromap II allows the generation of Thiessen polygons, Bezier and triangular contouring and trilateration. The program's menu-driven format is combined with dynamic user interaction to involve the user in the creation of a map or graph.

Micromap II is written in Applesoft; it requires 48K bytes of memory, Apple DOS 3.3 and one disk drive. Data can be entered from game paddles or from a digitizing tablet. Price is \$650.

Morgan-Fairfield Graphics, PO Box 5457, Seattle, WA 98105. Reader Service number 485.

## Business Bookkeeping

A new cash-basis accounting system, perfect for the small business, is offered by Dakin 5 Corp., PO Box 21187, Denver, CO 80221. The Business Bookkeeping System provides three activity ledgers, a general ledger and special reports. The system includes a security password

feature for accessing employee information, as well as a special sort key that lets you group customers, vendors and employees by specified categories. Business Bookkeeping is for Apple II computers; price is \$395. Reader Service number 490.

## Micros Do Science

It doesn't take a big mainframe to do big things. New on the software market are programs running under CP/M to crunch numbers in the worlds of physics, chemistry and engineering. Programs implementing semi-empirical quantum chemistry schemes allow professionals or students to eliminate the tedious hand calculations of the Heuckel or Grundle methods.

Chemical engineers can solve rate equations for coupled chemical reactions. In the area of group theory applications, a symmetry function generation program (Symgen) gives an analysis for the allowed states of atoms and molecules arising from one or more electronic configurations. Here, instead of Pac-man, it's Pauli-man who eats up non-Fermion states.

Scientific Software, 232 W. Lakeshore Drive, Lincoln, NE 68528. Reader Service number 484.

## DB Master for Hard Disk

A new hard disk version of DB Master for Apple II is available from Stoneware, Inc., 50 Belvedere St., San Rafael, CA 94901. DB Master Special Edition uses a 16K RAM card to increase file access speed. Because separate sort files are no longer needed with the hard disk version, sorting procedures are significantly accelerated. While the DB Master program itself remains on a single copy-protected disk, all data files can be stored on the hard disk, eliminating all disk swapping.

Price is \$499. Reader Service number 489.

## Versatile Terminal Software

The Terminal Program for the Hayes Micromodem II and Apple II simplifies data communication over telephone lines. The program originates and answers calls; creates, lists, sends and receives files; and manages communications parameters—as directed by commands selected from a menu or list of options. Hayes Terminal Program for the Micromodem II is distinguished by its compatibility with Apple DOS 3.3, Pascal and CP/M. It costs \$79.

Hayes Microcomputer Products, Inc., 5835 Peachtree Corners East, Norcross, GA 30092. Reader Service number 491.

## The Agricultural Apple

F.A.R.M. software, from Anthro-Digital, Inc., 103 Bartlett Ave., Pittsfield, MA 01201, handles a cash operation and allows for crops and livestock, enterprising, checkbook balancing and Schedule F printout. The package interfaces with VisiCalc so the farmer can test "what if" situations using actual data.

The On Farm program is intended for use by a single farm for its daily operation, the Educational program is for use by schools teaching agricultural finances, and the Commercial program is for accountants and farm associations to use for an unlimited number of farms. All programs require an Apple II Plus, 48K, two disk drives with DOS 3.3 and an 80-column printer. On Farm costs \$395; Educational costs \$250; and Commercial is \$995. Reader Service number 492.



## WordPro Interface

Most programs that interface with WordPro do so by creating sequential files, which WordPro can then merge into its own text files when outputting (such as when you print form letters). But WordPro cannot read these sequential files into its text area.

Swift, from Ini, Inc., 4013 Chestnut St., Philadelphia, PA 19104, translates sequential files into WordPro-readable text files. Once the conversion is made, files created by other packages can be read into WordPro, edited, and printed or saved as specified. Swift can also be used to convert text files created by other word processors into WordPro text files. Swift runs on the Commodore 8032 CBM computer with 8050 disk drives. Reader Service number 493.

## Write Track

If you've ever tried to juggle even a few different manuscripts, you know how hard it

is to keep track of them. Write Track is a computerized manuscript tracking system for writers. It tracks when you sent what to whom, the postage involved, and potential markets for each piece. The program runs under CP/M and requires 48K bytes of memory and two disk drives. It costs \$100.

Gradan Consulting Company, PO Box 3594, Thousand Oaks, CA 91359. Reader Service number 494.

## CP/M Buffer

Cache/Q can be installed in any standard CP/M 2.2 operating system; it automatically buffers data from the mass storage devices attached to the computer system. Cache/Q is invisible to all user applications and system programs, and requires no program modification. The buffer preserves data integrity on mass storage devices by updating modified sectors automatically. All data is on the storage devices and not just in memory, so it is immune from pow-

er failures and other malfunctions. Price is \$195.

Techne Software Corp., 3685 Mt. Diablo Blvd., Suite 130, Lafayette, CA 94549. Reader Service number 496.

## ZX-81 Software

A new range of cassette-based software for the Sinclair ZX-81 personal computer is available. Business applications include the Vu-Calc spreadsheet program for \$14.95, and Vu-File, priced at \$17.95, for general filing and retrieval. The Collectors Pack enables collectors to hold 400 records on hobby items such as stamps or coins. The Club Record Controller holds the personal records of 100 people. Eight cassettes for the "Fun to Learn" series are each available at \$12.95: English Literature I and II, Geography, History, Mathematics, Inventions and Music. The "Super Programs" series features game, quiz, conversion and household programs. The game applications include Backgammon,

Chess, Flight Simulation, Space Raiders and Bombers, and Fantasy Games. Bio-rhythms, available for \$13.95, prepares a complete personal chart. All programs except the "Super" series require the add-on 16K RAM pack.

Sinclair Research Ltd., 3 Sinclair Plaza, Nashua, NH 03061. Reader Service number 497.

## Programmer's Aid

A programming environment for the MBasic language is offered by Digital Marketing, 2670 Cherry Lane, Walnut Creek, CA 94596. Active Trace consists of three parts: Scope provides real-time information about a program as it runs. When a variable is encountered in program flow, its line number is identified and the current variable value is displayed. Options and features include reserved word list reconfiguration, choice of variables and program sections for analysis, and command files and output to console or list device.

Circle 133 on Reader Service card.

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SB — ..... Cabinet Kit \$645.00  
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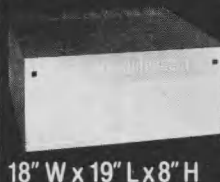
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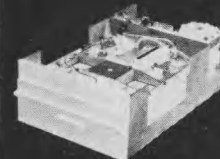
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\* CP/M is a trademark of Digital Research Corp.  
\*\* 1 to 4 piece domestic U.S. price

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**Colonial Data Services Corp.**

105 Sanford Street Hamden, Conn. 06514

VREF/GOREF provides complete cross-reference facilities, and includes all the professional options and qualities associated with mapping. The documentation includes a user's manual and Primer, which emphasize programming techniques to minimize errors. Active Trace costs \$125. Reader Service number 498.

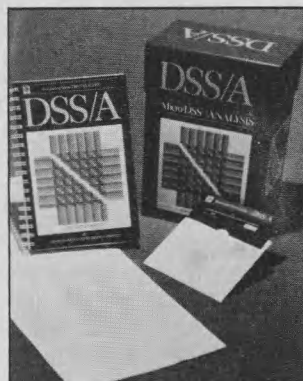
## Heath/Zenith Communications

MORTTY is a general-purpose communications program adaptable to almost any set of conventions in current use. It includes ASCII and Baudot code capabilities at any baud rate, and sets 17 parameters for adaptation to the various conventions. The program runs on the Heath/Zenith-89 with 32K of memory and H88-3 serial interface or an H8 with 32K, H19 terminal, H-17 disk system and H8-4 serial interface. HDOS version 2.0 is required. MORTTY costs \$100.

Phillip L. Emerson, 3707 Blanche, Cleveland Heights, OH 44118. Reader Service number 499.

## Management Analysis

A versatile package for the Apple II is being introduced by Addison-Wesley Publishing Company, Inc., Jacob Way, Reading, MA 01867. Micro-DSS/Analysis enables



Micro-DSS/Analysis from Addison-Wesley.

managers, analysts and policy administrators to handle information for planning, evaluating and reporting. The program requires a Pascal language card, two floppy drives and a printer. It is priced at \$495. Reader Service Number 495.

## Link CP/M with UCSD p-System

Xenofile, a software package that allows users of the UCSD p-System to access CP/M files and disks, has been introduced by SofTech Microsystems, Inc., 9494 Black Mountain Road, San Diego, CA 92126. Using XenoFile, a user can translate CP/M files to and from p-System files, as well as use CP/M program output as p-System program input and vice versa. The package has no capabilities to permit CP/M programs to be executed under the p-System.

XenoFile supports nearly all file operations provided by BDOS. CP/M's disk I/O unit, by providing one-to-one correspondence between BDOS

and XenoFile operations. Cost is \$50. Reader Service Number 462.

## Apple Touch-typing

Keyboard is an interactive, animated, high-resolution graphics program designed to teach the location of the keys and the correct finger motion for each keystroke. This program draws an image of the Apple keyboard on the screen; as each key is pressed, the appropriate letter is animated while the words appear below in ticker-tape fashion. This immediate reinforcement helps the user retain eye contact with the screen while learning the key locations. An optional typewriter sound is provided. Suggested drill activities for both adults and children are included in the manual, and a reproducible worksheet is provided for classroom use. Price is \$19.95.

SoftArt Software, 86 Green St., PO Box 417, Carver, MA 02330. Reader Service number 463.

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 **1-10**

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- ☒ does not require any previous computer experience to operate.
- ☒ allows you to create, amend, and delete any account record at any time.
- ☒ allows you to create, amend, and delete any report on file at any time.
- ☒ gives you instantaneous access to the files.
- ☒ automatically updates data on the Master File that is affected by transaction entry.
- ☒ automatically reverses accrual entries made in previous period.
- ☒ has built-in batch and run controls.
- ☒ prints hard copy log after every entry that can affect a file.
- ☒ has an automatic peripheral device check which tells you if a problem exists and where it lies.
- ☒ comes complete with Master Disk for your files, ready-to-run disk, and blank disk.
- ☒ screen layouts are clean, attractive and informative.
- ☒ accompanies all transactions with an audit trail.
- ☒ Transaction File has assigned-by-you reference #s.
- ☒ Transaction Listings can be listed sequentially or under variety of criteria selected by you.

- ☒ 64 combinations of inquiry options to Transaction File.
- ☒ can print reports at any one of nine levels of detail that you select.
- ☒ ignores invalid data, making unwanted or accidental entry impossible.
- ☒ can run on floppy disk or a hard drive disk.
- ☒ has extraordinary documentation that includes screen photos for every program.
- ☒ has utility programs which simplify computer housekeeping tasks.
- ☒ file recovery system normally repairs scrambled files and recovers data.
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# SOFTWARE REVIEWS

(from page 178)

you would be getting a lot for only \$80. There's more.

The copy command is not a library command, but a separate utility that comes with Multidos. It allows single drive copying of files and also permits copying of files from any alien operating system diskette to any other alien operating system diskette.

An interesting and very useful utility is the GR/CMD program. It integrates with the keyboard driver and lets you enter graphics characters directly from the keyboard. You must enter this as a DOS command "GR" and then you may enter Basic, for example, and easily create graphics packed strings. To enter the graphics mode, you press <SHIFT><CLEAR> and enter all of the graphics characters with a single stroke.

RS/CMD is a utility that searches RAM for an eight- or 16-bit word specified by the user. For 16-bit searches, you may enter a Z-80 mnemonic as an auxiliary, and look for associated JPs, Calls, etc. It is nice, but I wonder how useful it will ultimately be.

SPOOL/CMD—aside from the obvious defect that it doesn't always work—has some good ideas. It does ask for the number of 256-byte blocks to be used for buffer space and asks if you would like to paginate. It asks for the FORMS parameters, but, as I mentioned above, incorrectly sets their values.

The spooler asks if you would like the spooler to work; if not then it will not spool the output, but will control the output page parameters. I discussed the problems with the spooler with the author and he said that they would be corrected soon.

VFU/CMD is the best utility to accompany Multidos. It allows you to <C>opy, <E>xecute, <P>urge or <H>ard copy disk files. The copy option allows for selective file or total file copying. VFU will now ask if invisible or systems files are to be included. If the selective option was chosen you will be confronted with a screen with the names of all the files on your disk displayed. You simply press Y if you want that file copied, or N if not. The cursor position will automatically jump to the next name. When you are done, you are given the options of proceeding, restarting or aborting. To prematurely terminate the copying function, hold down the shift key; the file currently being copied will be finished, and then the program will abort. The purge option works exactly the same way the copy option does, except, of course, the result is different.

The print command will also ask if invisible or systems files are to be included in the hard copy output. This is an extremely handy program.

Now for the best of all, SuperBasic! The first interesting point is that with this Basic, you get 40K bytes of program memory. That is more than any other Basic. The best part of that is that nothing is sacrificed to give you this space. Since the Basic uses overlays, SuperBasic is actually a very powerful Basic, the most powerful one of which I am aware. You also get a second Basic, called BBasic, that has BOSS already within it!

In this expanded Basic, the letter commands must all be followed by <ENTER>. You may also use hex or octal constants. There are a number of CMD commands that enhance this Basic.

You have three options when entering SuperBasic. You may, as I've already mentioned, recover a Basic program left in memory by an alien operating system, recover Basic from a Multidos reboot or recover a Level II program, provided that you got to Level II via the CMD"X" command. The ability to recover is enhanced by the continue option. After a reboot, if you re-enter Basic with a "\*", for example, you will be asked if you wish to continue the program's execution. If you answer "Y," the program will resume execution where it left off. If not, then control is transferred to Basic command mode.

The other CMD options that improve the normal Basic are the space compression, the zero array, the delete array and the move/duplicate program lines. The delete array option should have been there in the interpretive Basic.

The CMD "O" (open additional file buffer) command is particularly useful when recovering an alien operating system's Basic program. Initially, when entered in this fashion, no file buffers are open. This gives you a way to open file buffers and then continue program execution.

The CMD "Q" (sort string array) command is a string sort of considerable speed and versatility. It will sort either vector (one subscript) or matrix (two subscript) arrays.

SuperBasic has even more enhancements. These are the overlay utilities. The Fnnnn command finds the ASCII characters in your Basic program specified by "nnnn." A much more powerful utility is the GE or Global Editing utility. In it, you may:

- change all or part of variable names
- change all or part of constants, data list items, or strings
- change graphics codes written as CHR\$(xxx) into packed strings
- change space compression codes into

packed strings

- merge adjacent lines into a single line
- break up a line into separate ones
- change reserved words in your program

The GE utility allows you to globally change reserved words. Thus, you can change every print to an Lprint.

Another useful option is to take your string definitions, defined by "BS=CHR\$(xxx)+CHR\$(xxx)+CHR\$(xxx)+...", as you would normally enter them if they contained graphics characters, and make them into a packed string "BS=...", where "." represents some graphics character.

The GE utility also supports the merging and dismembering of lines. You may specify the source line number and the object line number. The line will be dismembered at the first ":". If you are joining lines, they must appear consecutively in your Basic program.

Besides all this, you may renumber your Basic program. If lines cannot be found, then the renumbering will not take place, and a list of bad line references is given. You may renumber all or part of your Basic program. You may also get a cross-reference list of your variables or specific integers.

I did discover one rather strange error in this Basic. After editing a program line, the next Basic command entered from command mode generated a syntax error, regardless of whether the line contained a syntax error or not. If you re-entered the command, it then executed correctly. This was somewhat irregular, so it was difficult to narrow down. It appears to be a function of parsing the edited lines when you have leading spaces within the lines. The edited line is correct, and the only error that I have found is a bad syntax error on the first (and only the first) Basic command from command mode.

File handling is improved in SuperBasic as well. You have five "OPEN" modes:

- D random to existing file
- E sequential output to end of existing file
- I sequential input from existing file
- O sequential output to file
- R random I/O to file (variable length records)

BBasic is meant to be a development environment for the writing and debugging of programs. It has BOSS (Basic Operated Single Stepper) built right into it, and allows you to creatively trace and monitor execution of your program and keep track of the current values of specific variables. You may also single step your Basic programs, and at variable speeds! You may trace the program execution to the video (and the trace is designed to keep within a small block of the video and not screw up the entire screen), or you may trace to the printer.

This is all done by using the @ key as a control key. By pressing @ and another key, you tell BOSS what option to select.

Multidos, taken as a whole, is outstanding. The Basic is the best available in a

DOS package, and Multidos supports many options not found or poorly implemented in more expensive operating systems. The author deserves praise for this DOS. If you're in the market for a DOS, but don't want to spend next year's lunch money, try Multidos. (*Cosmopolitan Electronics Corporation, PO Box 234, Plymouth, MI 48170, \$79.95*).

**Bruce Powell Douglass**  
Vermillion, SD

## Ag Disk: Financial Management Series One

Five programs containing  
A variety of tools for  
Agricultural management

AgDisk consists of five programs for the Apple II Plus computer which are intended to aid in farm- or ranch-related money management. These programs include Farm Profit Analysis, Depreciation Schedules, Land Purchase Analysis, Loan Cost Calculator, and Interest Income Calculator. The programs are written in run-time Pascal which requires a 16K RAM card, but the Apple Pascal Operating System is not necessary for their execution.

AgDisk is supplied on a DOS 3.3 disk and is accompanied by an easy-to-use manual. The programs are menu driven, requiring only simple responses to select a program and to enter the necessary data. Several of the programs include a demonstration option to illustrate the operation of the program, and some of the programs provide an option which produces a printed worksheet for the collection and organization of information to be input to the programs.

Each of the five programs in this package runs independently; the programs do not interact with one another. AgDisk does not provide for the storage of data, and thus is not a data base management system. Rather, the programs in this package perform computations on financial information collected and summarized by the user.

The "Farm Profit Analysis" program, for example, requires the entry of income totals in five categories, expense totals in five categories, information about equipment depreciation and information about the value of farm property owned. All of this information must be re-entered each time the program is run. The reports output by this program include statements of profit-loss, management return, gross profits, intensity of capital use and overall performance.

Also included in the AgDisk package is a "Land Purchase Analysis" program which provides a comparison of the cost of purchasing land to the expected cash flow from that land and its projected market value.

The Depreciation Schedules program

allows the comparison of straight-line, declining-balance, and sum-of-the-year's digits methods for depreciating assets. The remaining two programs in the AgDisk package, Loan Cost Calculator and Interest Income Calculator, allow the user to evaluate the cost of borrowing money or the income to be derived from secure investments under various interest rates.

Most of the programs in the AgDisk package are well done and are quite easy to use. The printed worksheets ease the preparation of data for entry into the system, and the output reports are generally well constructed.

The major shortcomings of this package are the lack of provisions for the maintenance of financial records and the need to summarize financial information before entry into the system. However, the package provides a variety of tools which may be useful in the financial management of agricultural property. (*Harris Technical Systems, 624 Peach St., PO Box 80837, Lincoln, NE 68501, \$140*)

**Larry P. Gonzalez**  
Chicago, IL

## dBase-II

A relational data base  
Running under CP/M and  
Written in assembly language

Today there are scores of business programs available for microcomputers that are designed to organize and maintain information. Programs are available to keep track of mailing lists, checkbooks, inventories, library catalogs, personnel files, etc.

A lot of effort and expense can be incurred in researching which programs you need, purchasing them, and learning how to use them. One alternative to programs of this nature is a data base program that can be configured to perform any of the above tasks.

Data base programs are divided into three classifications: networking, hierarchical (a subset of the networking type), or relational. Networking and hierarchical data bases require that the data be organized into "owners" and "members." The programs then use pointers to relate the various groups of data. This type of data base structure can be complex to use, and may require considerable effort to set up or modify before any data can be entered. A relational data base is structured very similar to everyday tables. As a result, the relational data base is easier for the non-computer person to understand and use.

dBase-II is one such relational data base. Running under the CP/M operating system, dBase was written entirely in assembly language; thus it is very fast.

The program is well documented with over 350 pages split between a tutorial

and a reference manual.

dBase is written in the style of a command-line interpreter so you don't have to wade through a series of menus to get to the desired operation. This feature also allows you to write programs in the dBase data manipulation language so custom applications can easily be set up or a frequently used sequence of commands can be automated.

dBase has been used as the base for programs in such applications as small business accounting, job tracking, maintaining checkbooks and mailing lists, and even one to generate a flight plan. These programs, or command files, as they are called, are interpreted by dBase in much the same way as the Basic interpreter executes a program. The difference is that dBase makes the manipulation of files and records within those data files very easy.

dBase can work with up to 65,535 records in one file. Each record can contain up to 32 fields and up to 1000 characters. However, by employing a Link option, two files can be treated as one for a total of 64 fields and 2000 characters per record. This translates into a 130 megabyte file that dBase can manipulate. Obviously, you are not software limited with dBase, but hardware limited with most microcomputers. Any given field of a record can have a maximum of 254 characters.

dBase can use two data files simultaneously, and by entering Use filename, a new file can be substituted for one of the current files. A given file must be contained completely on one disk, but one file can be on one disk drive and another on another drive, or several files could be on one disk if desired. In addition, there are several commands that will involve a third file in their operation providing even more capability and convenience.

Over 50 major commands are available to the user in dBase, most of which allow several options. The majority of these commands can be used interactively, and all of the commands can be used in the command files to form a structured programming language. However, the casual user can effectively use dBase interactively with a basic knowledge of only 11 commands: create, use, append, locate, display, delete, recall, edit, sort, report, and quit.

Data may be entered into dBase from the keyboard or from other data files with the append command. These files can be either dBase formatted files or in a general delimiter-type format. Similarly, data can be written out in dBase format or a delimiter-type format with the copy command. This ability, in combination with chaining capability, permits dBase command files to be conveniently interfaced to other programs.

A general report command is available for generating quick table-type reports.

There are also cursor positioning commands for special printing needs such as checks or for making custom displays.



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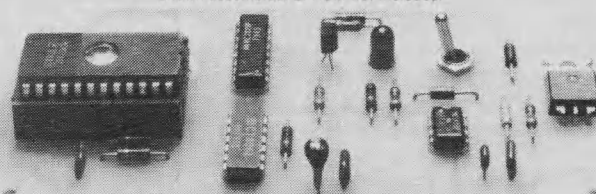
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Data files can be used to update other files, either adding to or replacing data in certain fields if certain conditions (which may be specified by the user) are met.

Other available calculational commands will total a given data base to another data file or sum designated fields to in-memory variables. In both cases, conditional instructions can also be embedded in the commands to limit their effect.

dBase also contains a full-screen editor that can be used to edit records and to build command files.

There are two different methods available for organizing a data base. Sorting a data base will actually rearrange the records on the file according to specified field, and can take some time on a large file. Successive sorts can be employed if different levels of organization are required. If this method is to be used regularly on a given file, a simple command file can be set up to perform the successive sorts automatically.

As an alternative, any given data file can be indexed on any combination of fields totaling less than 100 characters. Indexing a file is considerably faster than sorting it. In addition, an index only needs to be done once since subsequent data appends, edits, replaces or deletes will all update the Index file automatically if it is in use. Furthermore, up to seven indexes can be simultaneously maintained on one file automatically!

Once a file is indexed, a find command can be used to find a specific record. Typical find times on a floppy disk system are less than two seconds. A locate command is also available to search out data whether or not a data file is indexed, although it is not as fast as a find command on an indexed data base.

If the user has two data files with different structures but with at least one common field to serve as a key, then the join command can be used to form a new data file from a combination of the two.

dBase-II is well supported and is continually being improved. There are several other programs available which further support dBase, including program generators for quickly building command files, and other programs that interface dBase to other established software packages. All in all, dBase-II is an exciting alternative and a program worthy of serious consideration. (Ashton-Tate, 9929 Jefferson, Los Angeles, CA 90230. \$700).

**Clyde Lightfoot**  
San Jose, CA

## Introduction to Basic Programming

An introductory  
Basic course for  
The H-89

When I received the *Introduction to*

*Basic Programming* I first tried it out on my Heathkit H-89 (the course is designed to run under HDOS). After a few adjustment errors, I became proficient at answering the different types of questions thrown at me by a little computer with a smile.

Then I decided to try the course on different folks—especially some with no computer experience.

My wonderful wife was the first candidate, as she has had very little to do with computers. I got her started and left the room.

Once loaded the program rewards and chides the new student with the "beep" of the H-89 horn. If the answer to a question is wrong, you are chided with a "beep." If the answer is right you get three "beeps."

I listened intently from the other room. "Beep... silence, beep... silence, beep... silence!!!" This went on for an unexpectedly long time, but finally there were a few human expletives and I heard footfalls going down the stairs. I followed to offer support.

The newness of the computer and its relentless beeping had done her in. My wife, a usually patient person, had lost it with the computer. She said it was rude and too impersonal in its interaction. I tried to tell her that she would grow to like the thing and its calculating ways. She shrugged and walked off, returning only to play a few games and use the word processor from time to time.

There are several young people who live in our neighborhood and they visit from time to time. These youngsters served as the second round of candidates. On several occasions, I have started one of them with the Basic course, only to come back several hours later and have to physically drag all of them from the computer.

They eagerly returned the first night the computer was available and continued. Usually I had to usher them to the door, sending them home so that I could finally go to bed. This may sound a little preposterous, but there has been a great interest in the Basic course among the neighborhood youngsters.

Using this course has been an interesting experience with computer assisted instruction. I have found the different reactions of my wife and the neighborhood youngsters very interesting in regard to who might benefit the most from this type of instruction. We now have several young friends who can write simple Basic programs, and have an abiding interest in computers.

I think my wife's reaction has to do with the fact that she is not inclined toward mechanical things, especially smart mechanical things. I doubt that she will ever be interested in the inner workings of a computer program.

*Introduction to Basic Programming* is a computer assisted instruction program

which will enable an interested person to learn the rudiments of Basic programming in several hours of self-paced study. The course has a very snappy format, and makes excellent use of the graphics available on the H-89. The smiling computer terminal actually appears to move his pointers as various topics are emphasized on the screen.

The course material is easy to read and displayed nicely on the screen, but believe me, the "teacher" does not allow progress until the material is understood.

The questions interspersed in each section pertain to the material being covered. They come in three flavors: true and false, fill-in the blanks, and multiple choice.

A correct answer is rewarded with several "beeps!" and more material to study, but an incorrect answer brings a single "beep!" and review of past material.

I found the course to be fun because I was waiting to see what the next graphics display would bring. I knew that it would be exciting for any young person to experience the computer and the almost personal interaction with the images on the screen.

The course material is just what the title says: "Introductory Basic." The Basic taught is Benton Harbor Basic; although there is mention of Microsoft Basic in the workbook, there is no attempt to tie the two together.

The course covers the following list of subjects and Benton Harbor Basic commands: elementary programming, new, old, scratch, list, print, a section on variables and let, input, line input, alphanumeric and numeric data, goto, if... then, for... next, step, and a final section on subroutines. With a thorough knowledge of these commands, the new student has a good start on learning how to program in Basic.

After the student studies several sections, "It's time for a Unit Test." The smiling computer points to a clock on the wall, and the student is given a test which is corrected, reviewed and graded by the computer. This can be embarrassing for an old hand when a question or two is missed. The computer-aided review of missed questions is very thorough; there is no doubt why the answer was incorrect when the "teacher" is through.

At certain times when several commands have been studied and reviewed, the student is taken to the Basic Workshop. Here, Benton Harbor Basic is loaded into the computer and the student does actual programming with the computer. This is accomplished by using the workbook exercises supplied with the course. The student follows the exercises in the workbook and actually writes a program with the commands learned earlier.

The student is then encouraged to experiment with the Basic language us-



ing his own ideas. When finished in the Basic Workshop, the student can continue with further lessons. The lessons are menu driven so the student can jump from one lesson to another, or review lessons where more work is needed.

The lesson format is typically several statements about the topic of discussion, followed by examples of an actual program using those ideas. The programs are displayed on the screen and questions are asked about the program. What will happen now? How many times will this occur? What will the output of the terminal be? This method of learning how to program in a new language by actually working with that language is very effective.

The screen of the H-89 is divided with graphics, so parts of the screen appear to change and other parts remain the same. This excellent use of the H-89 graphics does make the course fast-paced and fun. The questions are thrown at you from the bottom of the screen, and the smiling computer keeps the top of the screen active. It's an interactive program.

A typical lesson will run approximately five minutes allowing time for the information to be read and absorbed. The reviews take about the same amount of time. The unit tests also take about five minutes, but the Basic Workshop and the workbook exercises can take as much

time as the student wants to spend.

The course contains 29 sections including the tests and workshop sections. This is a lot of material, and the student would be better off to spread this course over several evenings. If the course is followed, the student can be writing elementary programs within a few evenings.

The interactive instruction and the content of the course are very well done, but there are several technical aspects which could be better. Because of the amount of material that is presented, the course is distributed on two 5¼-inch floppy disks. A problem arises because the two disks are interdependent. If the student has only one disk drive, there is a problem of swapping the disks in the one drive. With a double drive system, the course moves very well and there is no problem of having to change disks.

Another item of note is that a real novice might have problems setting up the course, because Benton Harbor Basic and the HDOS Error Message file must be moved from an HDOS disk to the first course disk. There are excellent instructions for doing all of this, but the real novice will be better off to have the course set up prior to starting.

Another problem with the full disks is that the first disk which is loaded into SYO: is so full that SYO: must be booted

and reset from an HDOS disk prior to starting the course. I found this slightly disconcerting, as it would be nice for the novice to have the course self-start. Once the course is set up, however, it is very simple to run using the menu.

The workbook, which is really nine pages of photocopied material, could be more detailed. The workbook just covers the material presented. So much fine work was put into the computer program, a substantial workbook would make this course really first rate.

The final test, which I awaited with great fear as I worked through the course, turns out to be nothing more than another unit test with only a few questions about material from the course. It would not have been too difficult to make this test a composite of all the others and make the final test somewhat of a challenge. I would have felt better about all the work of getting through the course.

This program is well done and an interesting adventure in computer assisted instruction. It is a great buy for anyone who wants to start out in Basic. With some study and lots of fun, you or some of your friends can be doing great things with Basic. (Walt Bilofsky's Software Tools, 14478 Glorietta Drive, Sherman Oaks, CA 91432. \$199)

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For the TRS-80

Multidos (formerly Ultra II) gets its name from the fact that this is probably the most compatible DOS around. It will read disks written by virtually any other DOS. It even gives you the ability to load Basic and a Basic program while in another DOS, reboot with Multidos and recover the Basic program still in memory.

It comes with the best Basic I have ever had the pleasure of using and several utilities. Its low price should not fool you into thinking that this is a cheap product. It has a couple of minor problems, but overall it is an excellent DOS.

The manual is rather short, but readable, and contains all the necessary information. One point left out is that the password for the Multidos disk, should you feel inclined to selectively kill one of the system files, is "F36."

The DOS itself is small—taking up only 16 grans of disk space—but powerful. It extensively uses overlays to allow maximum space in RAM for programs. Even so, it is a fast DOS. For example, it only tries a disk I/O operation four times before returning an error. This is great if you have very reliable drives, but I still have the old gas-powered drives and they are a bit flaky. I personally prefer the default 10 tries used by TRSDOS and NEWDOS80.

You get a mini-DOS called Mighty Multi, activated by pressing the "::<" keys simultaneously. This will operate anytime you are in a program that has enabled interrupts. From this mini-DOS, you may copy, kill or list a file, or get a directory. Another nice option is that pressing the JLK keys together routes the current video contents to the printer, with graphics changed to ".". Pressing the HJK keys does the same but sends the graphics characters as well, if you have a

printer that knows what to do with them.

Unlike some operating systems, if your printer is not ready, you don't get hung up. Also, anytime Multidos needs to access a SYS file and cannot find it because you removed the systems disk, Multidos will not hang up.

Multidos boots up with its own keyboard driver that provides a flashing block cursor with repeat key function. Any or all of these can be defeated either by setting KEYBRD parameters (a single command line writes the new parameters to disk) or by holding down specific keys during the boot. It supports multiple DOS commands on a DOS command line; thus, you may enter Basic, set memory size, allow for I/O buffers, and load a Basic program, all with a single command line.

Multidos supports a limited JCL (job control language) via the do command, which substitutes a disk file for keyboard input. The do command acts on a disk file constructed with the build command. From "DOS Ready" you may execute the build command and construct a do file with lines keyed in. These are then stored in the file specified and may be executed whenever the "Do filespec" is entered. You may specify a break in the execution of the do command, turn off video output or display multi-line text.

If, for example, you have a rather long initiation process to a program, and would rather do something else during this process, a Do file will substitute in its commands whenever keyboard input is expected. You can even nest your DOS as deep as you like.

Multidos supports single drive copy. The Backup and Format procedures are the fastest that I have seen. One particularly nice feature of backup is that you may specify the number of tracks to be formatted.

During format, if there are tracks that need to be locked out, only the bad granule is locked out, not the entire track. These backup and format features are not supported by NEWDOS80, LDOS, DOSPLUS, TRSDOS, or any other DOS to

the best of my knowledge.

The directory is displayed in alphabetical order. It also has the option "K," e.g., "DIR 1 K" to display the Killed files. The "P" option will route the output of the DIR command to the printer. Incidentally the computer does not hang up if the printer isn't ready, and this is true for all the printer commands. Multidos will compute hash codes for you, if you happen to have a need. The forms command displays (and allows you to change) the line printer parameters of page width, page length and number of text lines per page. Multidos does have a spooler, which allows you to keep on doing your thing on the keyboard and execute programs while your printer outputs are being sent to the printer. You must be careful to set Forms after you initiate the spooler, since the spooler incorrectly changes the forms parameters.

Multidos has three types of resets. There is always the button at the back of the keyboard, and there is the boot command as well. Multidos also supports a dead command which sets all memory from 4000H upwards to 00H and then resets the computer. The CONFIG command allows you to adjust the stepping speed or density of the drive.

The KEYBRD command allows you to set:

- lowercase
- graphics driver
- repeating keyboard
- "CLEAR" key
- cursor character

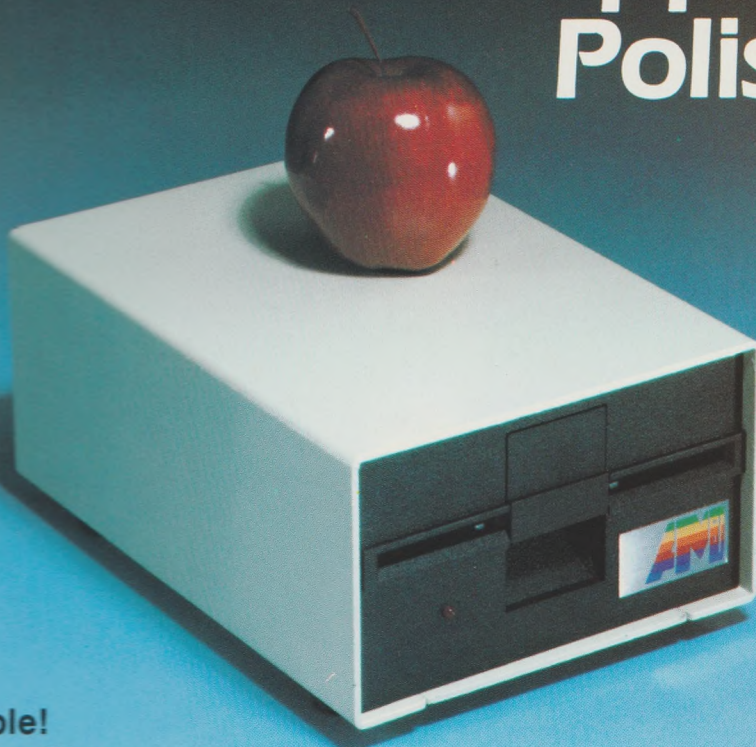
The break command allows you to toggle the <BREAK> key operation. The link command permits you to send everything that goes to the printer to the display or vice versa. The route command enables you to change printer output to display output or vice versa. The last library command that sets Multidos apart is TOPMEM, which gives you direct control over the top-of-memory pointer.

If this was all there was to Multidos,

(continued on page 173)



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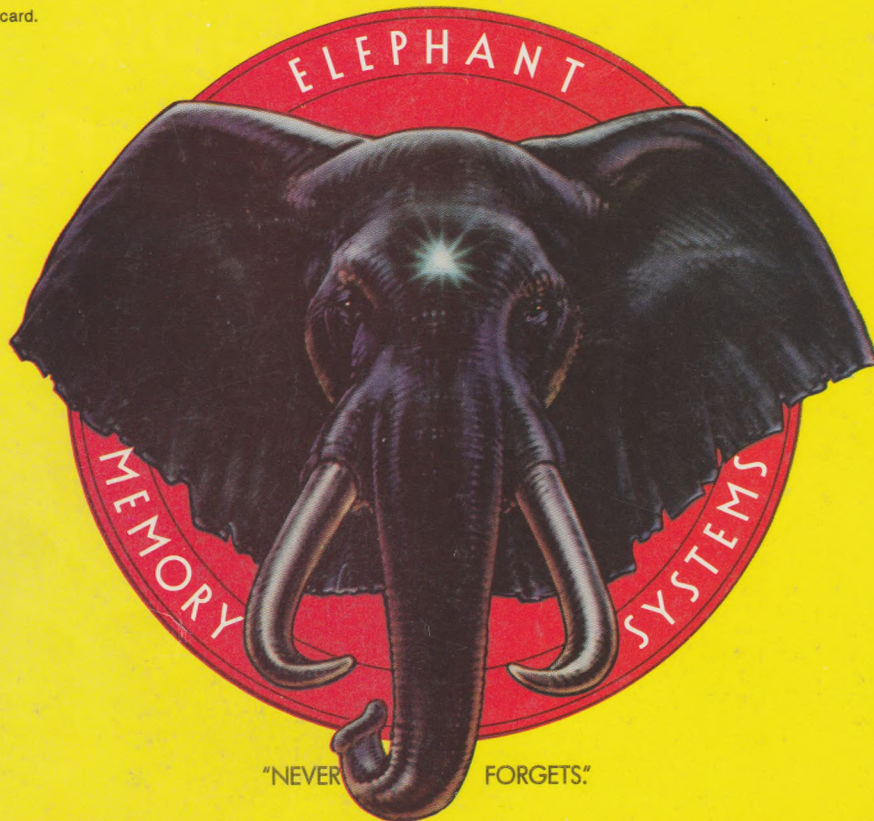
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